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From Clocks to Brass Sheet, Rod and Wire

The Story of the Bristol Brass Corporation —Its Fifteen-Fold Growth in 80 Years and the Development of Its Products

THE Bristol Brass Corporation of Bristol, Conn., was organized on April 3, 1850, as the Bristol Brass and Clock Company, probably as the result of agreement by some of the leading brass goods manufacturers of that time to provide themselves with a source of supply for their own industries. The list of officials and directors contains some of the most famous names in the history of brass manufacture. The first president was Israel Holmes and the secretary-treasurer was L. D. Coe, both outstanding figures in the early development of the American Brass Company. The first Board of Directors consisted of:

Israel Holmes	L. W. Coe
John P. Elton	E. N. Welch
Philo Brown	E. C. Brewster
Green Kendrick	J. C. Brown
Elisha Manross	

The company was organized with a capital stock of $100,000. This capital was increased steadily in later years as shown by the following table.

1868	$230,000	1908	$600,000
1874	300,000	1914	800,000
1901	400,000	1916	1,000,000
1904	500,000	1919	1,500,000

A site was chosen for the mill convenient to water power as this was the cheapest available power at that time. The first products were sheet brass and clocks; rod and wire manufacture was begun in 1900 and brazed tubes in 1901.

Until 1890, the mill did not roll much more metal than it actually consumed in the manufacture of brass clocks, but after that date new equipment was installed and sheet brass in considerable quantities was placed on the market.

Bird's-eye View of The Bristol Brass Corporation Plant

The manufacture of clocks was discontinued about 1860.

The present officers of the company are:

Alexander Harper, president and general manager.
Charles T. Treadway, vice-president.
A. D. Wilson, vice-president and treasurer.
H. N. Law, secretary.
Carl A. Gustafson, assistant treasurer.
J. H. Vickers, superintendent.
F. M. Siebert, sales manager.
C. V. Chapin, purchasing agent.
H. W. Staples, metallurgist.

A View of the Bristol Sheet Rolling Mill

The company has officers or representation in Boston, New York, Detroit and Chicago.

Plant and Equipment

The land and buildings and the company cover eight acres and have a capacity of 4,000,000 pounds per month. The raw material consists of electrolytic copper, brass special and High Grade zinc, Pig lead, Straits tin, and their own scrap. These and all other materials are brought to the plant on the company's spur from the main line of the New York, New Haven and Hartford Railroad and stored in convenient bins, ready for use. The mixtures are made up of weighed proportions controlled by the laboratory and taken to the casting shop which contains fourteen Ajax-Wyatt 1,200-pound electric furnaces and twenty-four pit fires. Billets and flat bars are cast in this shop; also 1¾ inch rods of special mixture.

The new sheet mill to which these bars go was the first mill in the United States to perform the breaking down operation by means of tandem rolls. The overhauling is done by a special Torrington slab milling machine. The annealing furnaces in this mill are the latest muffle type, Rockwell, oil-burning furnaces, accurately controlled as to temperature by Leeds and Northrup pyrometers. The resulting hardness of the metal is carefully checked by Ericssen, Brinnell and Rockwell hardness testers.

Certain types of special mixtures are still annealed in the old-fashioned wood-burning furnaces. The management of the company believes that for some classes of work nothing equals wood as a fuel. At one time the company owned several hundred acres of timber land to provide them with a steady source of supply for this necessity, but the land was gradually sold off when the chestnut blight came to Connecticut.

The regular running down practice of brass mill operation is followed, with annealing and subsequent pickles at intervals through the mill. Sheets are rolled from 3 inches to 16 inches wide and then slit to any desired measurement. Thicknesses are from 1 inch down to 0.005 inch. The capacity of the sheet mill is 2,500,000 pounds per month.

In the rod and wire mill, the company has a 2,000-ton extrusion press. This press takes billets 7 inches in diameter and turns out rods from ⅜ inch to 3¼ inches in diameter. The rods are cold drawn down as small as 0.032 inch. The capacity of the rod mill is about 1,500,000 pounds per month.

The metal is transported throughout the plant by six 5-ton cranes. Air hoists and small electric hoists are used where convenient. Material is also handled by storage battery trucks and trailers. There is practically no hand pushing.

The company specializes in rivet and screw wire, and welding rod; also in low brasses, making a very high grade product for uses in vanity cases, cigarette cases, etc. (For the low brasses the wood anneal is used.) They also make rectangular strip with round or square edge from ¼ inch wide to ¾ inch wide and 1/32 inch to 5/16 inch thick, which is used for square nuts and window hardware. About 100,000 pounds per year of brazed tubes are also made.

The mills are operated by electric power purchased

Wire Mill

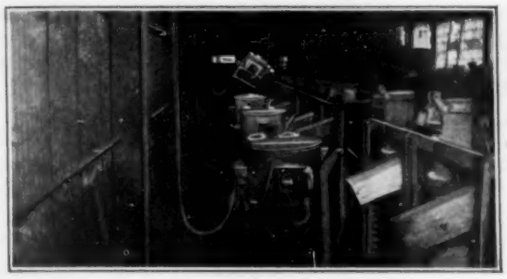
from The Connecticut Light & Power Company. They also operate a high and low pressure Slater Engine which furnishes power for a portion of the plant.

A battery of four steam boilers is maintained for the purpose of distributing heat throughout the plant.

The mill has a modern, well equipped laboratory in which are made chemical analyses of the raw materials, and finished products; also hardness tests and metallographic examinations. A rigid inspection follows each operation, and an analysis is made of each heat of the metal poured from the electric furnaces and hand crucibles.

The company operates a machine shop for repair work, roll grinding, etc., and a first aid room for taking care of injuries when they occur.

When running at capacity, the mill employs about four hundred men.



Electric Furnace Section.

Shipping Department

Shipping is done by freight car and motor truck. One shipping platform has room for seven freight cars at a time. In addition to this transportation service, the company has a fleet of its own trucks, which deliver to nearby customers.

The company makes large quantities of brass for automobile radiators of 0.005 inch gauge with a tolerance 0.00025 inch. Users of this material are extremely severe in their requirements stating that discrepancies wider than 0.00025 inch add 8 cents to the cost of making an automobile radiator. This is an interesting commentary of the problems of manufacturers who sell to the automobile trade.

Another specialty of the company is rivet wire for tubular rivets in which they are said to make one of the best products on the market.

The quality of their products has been built up through knowledge of the art and meticulous care. Three or four generations have grown up in this business and it is not uncommon to see father, son and grandson all working together in the mill. Men who have seen long service in the company and are superannuated are retired on pension.

The Bristol Brass Corporation Plant in 1850

Metals for Thermocouples

Q.—Please advise me as to the metals that are available for manufacture of thermocouples for pyrometers. I am especially interested in the least expensive metals and alloys for this purpose, to be used in instruments providing only rough results, and for comparatively low temperatures. If possible, I should like to use materials available in the Seattle, Wash., district.

A.—Various metals and alloys are used in making thermocouples for different ranges of temperature. We cannot tell exactly what temperature range you mean to include when you say "comparatively low temperatures"; we are therefore listing below the combinations in most common use for all temperatures up to about 2,300 degrees Fahrenheit.

Copper-constantan couples can be used with precision up to about 650 degrees Fahrenheit, and with fair accuracy up to 1,000 degrees Fahrenheit. Above this temperature the copper oxidizes seriously. "Constantan" is the trade name for a special alloy of copper and nickel.

Iron-constantan couples are suitable for use up to 1,650 degrees Fahrenheit but are less satisfactory than copper-constantan in the lower temperature ranges because the voltage generated is less and, consequently, the accuracy with which the temperature can be read is less.

Chromel-alumel couples give satisfactory service up to about 2,300 degrees Fahrenheit. "Chromel" is the trade name for a special alloy of nickel and chromium, "alumel" a special alloy of nickel containing aluminum.

Which one of these combinations you should choose depends upon how you want to use the couple. The size of wire and also the type of instrument you will require for measuring the potential of the couple will also be governed by the exact nature of your problem. The engineering department of your local electric power company would probably be willing to advise you with respect to these details. Or, if you care to describe to us exactly how you plan to use your thermocouple, we will be glad to give you the additional information you need.

H. M. St. John.

Annual Foundrymen's Convention

Thirty-Fifth Annual Convention and Exhibit American Foundrymen's Association Held in Chicago, Ill., May 4-7, 1931.*

FROM the opening day on Monday, May 4th, till the close of the meeting at 6:00 P. M. on Thursday, May 7th, foundrymen attending the thirty-fifth annual convention of the American Foundrymen's Association were provided with a program of technical sessions, round table meetings, and shop operation courses, of surpassing interest. In addition to the meetings, there were on display in the exhibition halls of the Hotel Stevens of Chicago, where the week's activities were centered, a splendid group of exhibits of foundry equipment and supplies shown by some 160 manufacturers and dealers catering to the foundry industry. The meetings were planned to provide papers and discussions for all branches of the industry and for the executives, engineers, metallurgists and shop men. The Chicago district, the largest foundry center in the country, provided many points of interest for those who wished to spend a part of their time in plant visitation.

At the general opening meeting on Monday, May 4th, the exchange paper of the Institute of British Foundrymen was presented. This paper, by V. C. Faulkner, Editor of the British Foundry Trade Journal, gave an interesting review of the British foundry industry.

For the business session on Thursday an interesting lecture was secured. Colonel T. C. Dickson, Commandant of the U. S. Arsenal at Watertown, Mass., talked on Centrifugal Casting of Guns, one of the outstanding developments in ordinance production.

Foundry Costs

The Committee on Foundry Costs had two interesting reports to present for discussion. The Committee on Methods for Determining Molding Costs made a survey of the practices used throughout the country and the data secured was presented at this meeting. The second committee report was on data which should be furnished by the purchaser of castings when requesting bids.

The Nonferrous Cost Committee had an entire session devoted to discussing nonferrous foundry cost methods. One of the foremost cost accountants in the country, E. A. Baker of New York, gave a talk before this meeting, discussing weak points in cost systems.

Shop Operation Courses

Five shop operation courses were scheduled for this year's convention, two more than for last year's meeting, as courses on sand control and malleable founding were added.

These courses, which have been established for giving instructions in the fundamentals of shop practice, covered in addition to the two new courses, gray iron, steel and nonferrous founding.

* The convention is being held as we go to press. A complete report will be given in the June issue.—Ed.

Non-ferrous

The Nonferrous Shop Operation Course Committee, under the chairmanship of E. R. Darby, Federal-Mogul Corp., Detroit, planned three sessions. Serving with Mr. Darby on this committee were W. M. Marr, Ohio Brass Company, Mansfield, Ohio, and D. E. Broggi, Neptune Meter Company, Long Island City, N. Y.

The three sessions were devoted to gating and risering. The first session was given over to a discussion of the principles of shrinkage and the second and third to discussing applications of gating to various types of alloys.

Sand Control

Because of the demand which has arisen for information on sand control, the Committee on Foundry Sand Research has formulated a four-session shop course on this subject in order to give the practical foundrymen instructions in the fundamentals necessary when sand control is being started in a medium or small shop.

The first session of this course was held on Monday afternoon, May 4th. The four subjects, one of which was taken up each day, are (a) moisture control, (b) permeability and fineness control, (c) strength control, and (d) sand losses.

Pattern Production Problems

An innovation for A.F.A. conventions was the round table meeting on pattern production. A series of questions was submitted for discussion at this meeting, which was scheduled for Tuesday morning, May 5th. Vaughan Reid, President of the City Pattern Works of Detroit, presided.

Sand Control Equipment Exhibit

The Committee on Foundry Sand Research had on display a working exhibit showing equipment and apparatus which has been developed for the testing and control of foundry sands. Practically all the equipment described in the 1930 edition of Testing and Grading Foundry Sands, as issued by the Committee, was shown. Attendants were on hand to supply information to those desiring it.

Abstracts of Papers

GETTING A PROGRAM OF COMMUNITY APPRENTICESHIP UNDER WAY

By HAROLD S. FALK

Stressing the importance of local groups developing programs of community apprentice training, this paper details the procedure of starting such a program and continuing it. Attention and hard work, with some one

person made responsible for the enterprise, are prime essentials in any such project. For purposes of illustration, a local manufacturing association is here considered as the sponsoring group. The program will begin with presentation of a statement to the association in order to obtain united, organized support, and the points such a statement should contain are outlined. A committee then is appointed to evolve a plan of training, and, once their plan has been accepted, the committee members should first organize apprentice training within their own plants. Details are given as to organization of such shop programs. After months of trial in plants of the committee members, the task of organizing other member plants may be undertaken. Success in doing this depends on the tact, patience, perseverance and knowledge of apprentice training possessed by the committee. Permanent duties of the committee also are outlined, one of their duties being the making of a survey of the actual need of trained mechanics.

SOME OBSERVATIONS ON PREPARATION AND USE OF SYNTHETIC SAND

By L. B. KNIGHT

The use of synthetic sand, which has increased extensively in the past few years, has emphasized the need for information as to how this material can best be prepared. Mechanical mixing to coat the sand grains with the bonding material is a necessity. Many foundries have found it advantageous to start their rebonding program with facing sands, later extending the work to the entire quantity of sand used. To use this material, definite standards of permeability, bond strength and moisture must be established and maintained. An illustration of the practice in one plant is cited. The development in continuous systems is discussed, showing the different methods used.

DEEP ETCHING OF BRASS APPLIED TO GATING PROBLEMS

By R. W. PARSONS

Deep etching of brass castings here is shown as applied to determination of the best method for gating castings. Defects on original gating are shown. Changing sizes of test bars brought out a definite relationship between length of bar and diameter to obtain sound castings. Pouring temperature also is shown to have a definite relation to the physical properties obtained. Causes of leaks resulting in defective globe-valve castings were investigated by deep etching; re-gating reduced the losses to a minimum. Limits to the application of deep-etch testing are given.

PERMANENT MOLD FOUNDRY PRACTICE FOR BRONZE CASTINGS

By HENRI MARIUS

The term "permanent molds" in this paper is used to designate long-life iron molds. These are stated to have a metallurgical advantage over sand molds in increasing strength and increasing the ability of copper-tin alloys to hold more lead. Foundry factors are stated to be most important, the principal ones being correct pouring temperatures, guarding against porosity and oxidation, gating and risering, melting, mold-wall thickness, clamping of molds and the type of iron used in the molds. Each of these factors is discussed in detail.

Chromium as a Printing Surface

By GEORGE B. DRACH[1] and LOUIS WEISBERG[2]

The authors of this paper report on a year's experience with the use of chromium plated printing surfaces at the plant of the Jersey City Printing Company, printers of telephone directories and other books requiring extremely long press runs. Tests were made to determine how the chromium would affect the linotype metal, which should not be contaminated due to its reclamation value. These indicated that chromium could satisfactorily be used, and a plant designed primarily for plating with chromium the printing surfaces of linotype slugs was installed by Weisberg and Greenwald. The plant can also be used for plating electrotypes or stereotypes.

In runs of such length as 1,800,000 impressions, chromium plated printing surfaces were found to hold up throughout without requiring repairs or refinishing, whereas ordinary plates as well as nickel plated plates were found either to require refinishing at considerable expense due to press and press crew idleness, or to produce poorer impressions as the run lengthened. The chromium plated surfaces produced very clear, sharp impressions throughout and showed no appreciable signs of wear. The Jersey City company is now chromium plating the slugs used for all directories requiring long runs. This materially lengthens the life of the slug, an important factor in this branch of printing since slugs are used for as long as possible when no correction is required, ten years being heretofore considered good length of life for a slug.

The best chromium plating procedure for this work was determined by comparative tests, type or plates plated by various methods being run on presses simultaneously to test their printing merits.

The authors, while endeavoring to avoid overstating the advantages of chromium plating printing surfaces, show clearly that such plating can be used to reduce printing costs materially as well as to improve printing on long runs. It is pointed out that the cost of the half-hour chromium deposit which is put on the printing surfaces is much less than the difference between the cost of a copper electrotype and a nickel plated one. Nickel plated surfaces which have lasted through 1,500,000 impressions have been produced, but the nickel deposit required 1½ hours in the nickel tank. The chromium deposit of equivalent or better printing qualities was produced by one-half hour of deposition. Such a plate is thinner and less likely to "fill in" the recesses in the type.

[1] General Superintendent, Jersey City Printing Company, Jersey City, N. J.
[2] Consulting chemical engineer, Weisberg and Greenwald, New York City.
This article is an abstract from a paper presented by these men before a printing conference of the American Society of Mechanical Engineers, at Washington, D. C., March 16 and 17, 1931.

A New Silicon-Zinc-Copper Alloy

By DR. E. VADERS

Hirsch, Kupfer- und Messingwerke A.-G., Finow (Mark), Germany

The Use of Silicon as a Deoxidizer and Alloying Agent—Preparation of the Alloys—Determination of Solid Solubility Limits—Mechanical and Physical Properties — Part 3, Conclusion*

PAPER READ AT THE MEETING OF THE (BRITISH) INSTITUTE OF METALS, AT SOUTHAMPTON, ENGLAND, SEPTEMBER 12, 1930

The Extruded and Drawn Alloys

SILICON-ZINC-COPPER alloys are distinguished from ordinary zinc-copper alloys by their plasticity. Whereas, for example, an alloy of 80 per cent copper with 20 per cent zinc can be worked hot only with difficulty, silicon-zinc-copper alloys of suitable composition may readily be extruded hot into rods, tubes, and other shapes. The extrusion or forging temperatures vary from 650° to 750° C., according to the composition. The case of extrusion increases with the silicon and with the zinc content, but it must be remembered that, although alloys with a high silicon and a high zinc content can be readily extruded hot, they become too brittle for technical use at the ordinary temperature. The best results are obtained with alloys containing 2-5 per cent silicon and 18-10 per cent zinc; rods extruded from these alloys have a tensile strength of 60-70 kg./mm.² and an elongation up to 30 per cent.

TABLE VIII.—4:15:81 SILICON-ZINC-COPPER ALLOY DRAWN AND ANNEALED.

Rods Extruded at 15 mm. diameter	Tensile Strength Kg./mm.²	Elongation Per cent	Brinell Hardness 10/1000/30
Drawn down to 14 mm.....	88.2	15.0	202.0
Annealed at 600° C. for 2 hrs.	74.2	14.0	171.5
" " 600° C. " 3 " .	74.6	19.0	176.8
" " 700° C. " 2 " .	62.8	26.0	148.2
" " 750° C. " 1 hr..	61.0	27.0	141.0

Tables VII and VIII show the mechanical properties of an extruded rod 15 mm. in diam. before and after drawing to 14 mm., and the effect of time and temperature of annealing in each case. Annealing is essential in both cases to prevent subsequent season-cracking.

The values in Table VII. show the readiness with which the material can be worked hot; if the alloys were overworked they would exhibit work-hardness characterized by a low ductility of the extruded rod as compared with the same rod after annealing. Table VIII. shows that annealing causes a slight fall in ductility instead of an increase.

TABLE IX.—3:20:77 SILICON-ZINC-COPPER ALLOY EXTRUDED INTO RODS.

Diameter of Rods Mm.	Tensile Strength Kg./mm.²	Elongation Per cent	Brinell Hardness 10/1000/30
11.0	60.8	34.0	
11.0	59.6	38.0	About 120
11.0	57.5	40.0	
9.5	59.6	36.3	" 124
9.5	59.0	40.0	

Table IX. shows the mechanical properties of small diameter extruded rods of an alloy with 77 per cent copper, 3 per cent silicon, and 20 per cent zinc.

The 9.5-mm. rods were drawn down to 7.5 mm. in several stages; they then had a tensile strength of 75 kg./mm.² and an elongation of 15 per cent.

SILICON-ZINC-COPPER ALLOYS WITH ADDITIONS OF TIN AND NICKEL

Table X. shows that tin reduces the elongation and, to a small extent, the tensile strength of silicon-zinc-copper alloys. Addition of nickel also deleteriously affects the tensile properties; thus the elongation of alloy 2 (Table VI.) is reduced from 40.3 to 2.1 per cent by the addition of 2 per cent nickel. The hardness is, however, slightly increased, but the tensile strength diminished by the nickel. These results are interesting, as nickel usually improves the properties of zinc-copper alloys. The reduction in the strength and ductility of silicon-zinc-copper alloys by nickel is to be attributed to the formation of nickel silicide.

TABLE X.—SILICON-ZINC-COPPER ALLOYS WITH TIN AND NICKEL. CHILL-CAST BARS HAVING A CROSS-SECTION 10 × 6 MM.

No.	Copper, Per Cent	Silicon, Per Cent	Zinc, Per Cent	Tin, Per Cent	Nickel, Per Cent	Tensile Strength, Kg./mm.²	Elongation, Per Cent	Brinell Hardness, 10/1000/30
1	83.0	2	14	1.0	..	34.5	23.3	85
2	82.0	2	14	2.0	..	26.1	7.1	108
3	81.5	4	14	0.5	..	44.8	14.2	123
4	81.0	4	14	1.0	..	44.8	7.5	129
5	80.0	4	14	2.0	..	43.0	4.0	133
6	81.0	3	14	..	2	32.9	2.1	146

THE PREPARATION OF SILICON-ZINC-COPPER ALLOYS AND THEIR CASTING PROPERTIES

Preparation

Although it was unnecessary to use a silicon-rich alloy in the preparation of the 2-kg. melts used for casting the test-pieces, it is essential to do so with melts of about 300 kg., otherwise the silicon floats on the surface of the bath and dissolves only slowly as it becomes coated with a zinc oxide layer which acts as an insulating sheath when the bath contains zinc derived from the addition of scrap. Hence it is advisable to prepare a 10 or 20 per cent. silicon-copper alloy first; this is so brittle that it can readily be broken up to be added to the charge in small pieces. The bulk of the alloy is prepared by adding a part of the silicon-copper alloy to a part of the copper previously

* Part 1 and 2 appeared in the issues for March and April, 1931, where Figs. 1 to 15 and Tables I to VII appeared.

melted, then adding the rest of the copper and silicon-copper alloy in small portions as it melts into the mass. After thorough stirring, the zinc is added, preferably also in the form of a high zinc-copper alloy, at a temperature not much exceeding 1000° C. For chill-castings the metal is cast at 950°-1000° C., but for thin-walled castings, especially if made in green-sand molds, a higher casting temperature is desirable.

(1) Casting in Sand Moulds.—The oldest known copper alloys for sand-castings are the tin-copper alloys, which for a long time could not be displaced by any other material, as their fluidity far exceeded that of any other copper alloy. With the advance of technique and the increasing demand for better alloys it was found that, in many cases, copper-tin alloys were unsatisfactory, and other casting alloys having a higher tensile strength than copper-tin alloys were developed; such were, for example, aluminium-bronzes and special brasses containing other elements in addition to copper and zinc. Although these had a higher tensile strength than the ordinary bronzes, much difficulty was experienced in making good castings owing to the inclusion of aluminium oxide, etc. These inclusions reduced the tensile strength appreciably, so that the mechanical properties of castings of aluminium-bronze rarely reached the values obtained on a carefully prepared tensile test-piece. Moreover, aluminium-bronzes also undergo a relatively large contraction on solidification. Silicon-zinc-copper alloys can not only be readily poured, but they possess all the desirable tensile properties of aluminium-bronzes. From Figs. 16 and 17 it will be seen that there is not the slightest trace of porosity in the castings. Fig. 16 shows that even with considerable differences in the cross-sectional area the castings are free from internal pipes and are of a uniform density throughout. The fluidity of the alloys is so great that even thin-walled sections, 2 mm. thick or less, can be poured without difficulty. An important feature is that the tensile strength is to a large extent independent of the thickness of the test-piece; the result is obtained whether the test-piece is cut out of the casting or cast separately. Table XI. shows the tensile properties of some specimens cast from a large melt; it will be noticed that the difference in the values for green-sand and dry-sand castings is not great.

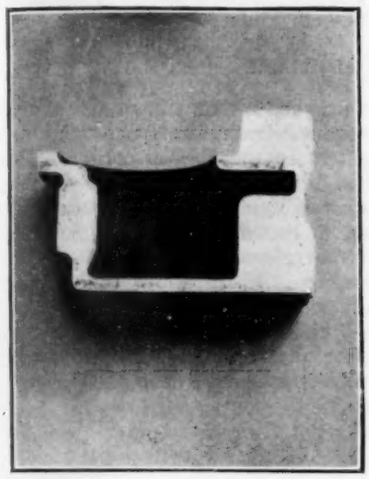


Fig. 16—Section Through Sand-Casting of Alloy Containing 81 Per Cent Copper, 5 Per Cent Silicon, 14 Per Cent Zinc.

TABLE XI.—SAND-CASTINGS, 15 MM. IN DIAMETER, FROM LARGE MELTS (100-200 KG.) CAST SEPARATELY.

No.	Composition, Per Cent (by Analysis) Copper	Silicon	Zinc	Tensile Strength, Kg./mm.²	Elongation, Per Cent	Brinell Hardness, 10/1000/30	Mould
1	85.25	4.75	10	48.6	12	138	Green sand
				47.0	11	128	Dry sand
2	81.5	4.5	14	46.0	9	125	Dry sand
				47.1	10	136	Green sand

(2) Chill-Cast Alloys.—Permanent mould castings have, up to the present, almost invariably been made from "aluminium-bronze," and little is known of the use of copper alloys with a high copper content for this purpose. In a recent review[6] the advantages and disadvantages of various copper alloys for chill-castings are discussed. Brasses with a high zinc content present difficulties owing to the formation of zinc oxide which with continuous working soon contaminates the mould. "Aluminium-bronzes" which have been recently used for chill-cast parts suffer from the disadvantage of being readily oxidized, so that surfaces contaminated with aluminium oxide are produced. Aluminium-brasses, on the whole, behave well, as the presence of aluminium imparts an especially smooth surface to the castings. Besides the question of surface appearance, however, the tendency of an alloy to piping and the contraction on solidification must be taken into account, as well as the fluidity of the molten alloy. Alloys which have poor fluidity must be heated to a higher temperature when making thin-walled castings, and this increases the contraction on cooling. Silicon-zinc-copper alloys, however, are particularly suitable for chill-casting, owing to their extraordinarily great fluidity and the very clean surfaces of the castings due to the cleanliness of the surface of the molten metal. The contraction on cooling is such that the casting scale can be readily removed—an operation which is very troublesome with other copper alloys. The most suitable alloy for chill-casting is that containing 81-82 per cent copper, 4-5 per cent silicon, and 14 per cent zinc.

(3) Pressure-Cast Alloys.—The above remarks as to the suitability of silicon-zinc-copper alloys for chill-castings apply equally well to their use in pressure castings, more especially is the fluidity of the alloys of great value in producing smooth surfaces on the castings. Generally, copper alloys are not used for making pressure castings, but recently attempts have been made so to use brasses with 55-65 per cent copper. These alloys do not give castings with smooth surfaces, and frequently they are porous. Pressure castings of the silicon alloys with, e.g., 81.5 per cent copper, 4.5 per cent silicon, and 14 per cent zinc are not only denser but have smoother surfaces than those of brass; they can be polished and plated in any of the usual baths, and thus form a valuable constructional material. Their strength is greater than that of similar

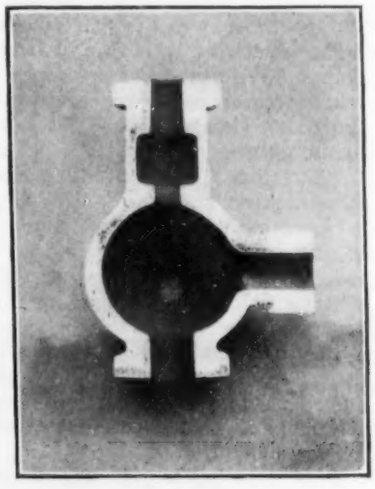


Fig. 17—Cross Section Through Another Example of a Sand-Casting of Alloy Containing 81 Per Cent Copper, 5 Per Cent Silicon, 14 Per Cent Zinc.

[6] J. Inst. Metals, 1928, 40, 187.

brass castings, and in absolutely non-porous pieces may reach 45-50 kg./mm.^{2} with a Brinell hardness of 140-160 compared with that of 90 for ordinary brass.

Machinability of Silicon-Zinc-Copper Alloys

These alloys differ little in their working properties from the ordinary zinc-copper alloys, and can be turned, drilled, and cut without difficulty. All are easily soldered, but joints should preferably be made by welding, as the presence of silicon reduces the tendency of the metal to oxidize. In the form of wires, alloys with 2-3 per cent silicon make useful welding rods.

The Manufacture of Bells from Silicon-Zinc-Copper Alloys

It is not by accident that copper-tin alloys have been used since ancient times for the manufacture of bells, although cheaper alloys were known. No alloy yet discovered has sonority equal to or better than that of copper-tin alloys, although quite a number of alloys when cast into suitable shape produce bells having an endurable tone. These bells are, however, usually more expensive than those made from tin-bronzes, so that the bellfounder has no incentive to make them. Tests made in Germany with bells made of aluminium-copper alloys showed them to be unsatisfactory as, compared with bells made of bell metal, they had a much higher tone. The tone range also was not so good as with the ordinary bronze, the overtones being sometimes too high and sometimes too low, and the tone volume was not so great. Similar objections apply to steel bells.

Bells made of silicon-zinc-copper alloys, especially those containing 81-82 per cent copper, 4-5 per cent silicon, 14 per cent zinc, and about 0.5 per cent tin, have, however, the same tone characteristics as bells of the same size made of tin-bronze. All subsidiary tones, such as the upper and lower octave, the third and the fifth, which are of such great value in determining the melodious character of the bell, are correct, but the bells have a somewhat mellower tone than that of bronze bells. This is the more interesting as the specific gravity of the new alloys is about 10 per cent less than that of bell bronzes.

SUMMARY

The results of this work show that silicon-zinc-copper alloys have a homogeneous solid solution structure up to a much higher silicon content in the copper corner of the ternary diagram than has hitherto been assumed—for example, whereas 2 per cent silicon was thought to be the maximum solid solubility in the 90 per cent copper alloy, it has now been shown that about 4 per cent silicon can be retained in solid solution. These alloys with a high silicon content, especially when it is all retained in solid solution, have valuable properties. They can be worked hot as well as cold. Some of the alloys of this type have outstanding properties as bearing and bell metals.

Refining Zinc

Q.—We use zinc for making our dies for stamping sheet metal ornaments and statuary. We pour all molds or dies open, and this, of course, makes the faces of the dies at the bottom of the moulding box.

Sometimes we use slab zinc but mostly we use new scrap sheet zinc which scrap from the zinc ornaments we stamp. We have always bought our sheet zinc from one manufacturer and have always had good results. Recently we bought some sheet zinc from another zinc manufacturer and used the scrap from this sheet zinc for our dies, together with some scrap from the other manufacturer's sheet.

Since mixing these two kinds of scrap we have been having trouble with our dies. The faces of the dies are flakey and not smooth as heretofore, and they have soft spots which, when rubbed or filed away, leave hollow places.

We are wondering if mixing the two scrap metals is the cause of our trouble, and if there is anything we can do to remedy this defect. Can we, by mixing some other soft metal with the zinc, get a smoother and firmer casting for our dies?

Will it be of any benefit to you in determining our trouble by having a small sample of the zinc?

A.—We suggest that you try refining the scrap zinc by securing an iron melting pot that will hold several hundred pounds and melting the scrap zinc in it. Do not overheat the zinc. You can judge the temperature by the color of the metal. Zinc melts at 419 deg. C., and should not be heated above 500 deg. C., at which point it reaches a white color.

Now procure a green hickory pole, insert it in the molten metal, to the bottom of the melting pot. This will boil the metal and all the oxide and dross will rise to the top of the melting pot in a few minutes.

Now add a few handfuls of sal ammoniac; skim the dross off the metal, and add 1 oz. of aluminum to each 100 pounds of zinc.

Pour this metal in slabs or ingots and remelt for casting your dies. If you cannot secure a green hickory pole, a raw potato will answer the same purpose. Insert the potato with a pair of tongs to the bottom of the pot of molten metal and hold it there until the metal is through boiling. Then add the sal ammoniac as stated above. This will clean your metal, which should help improve its condition.

W. J. Reardon.

Mirrors by Deposition of Metal on Glass

The U. S. Bureau of Standards has just issued a new Circular No. 389, which supersedes Letter Circular No. 32, Methods of Silvering Glass. It deal principally with the methods for producing mirrors by the chemical deposition of silver on glass. The Brashear, Rochelle salt, and formaldehyde formulas are given, together with a detailed discussion of the precautions which should be taken to avoid danger, and the technique which has been found to yield the most satisfactory results at the bureau. Methods are also given for the chemical deposition of copper, platinum, or lead sulphide, and for the production of reflecting films on glass by cathode sputtering, and by the condensation of vaporized metals.

The information will be of great interest to amateur and professional makers of telescopes and other optical instruments, as well as to those engaged in the work of silvering ordinary mirrors.

Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

How to Spin a Copper Tea Urn

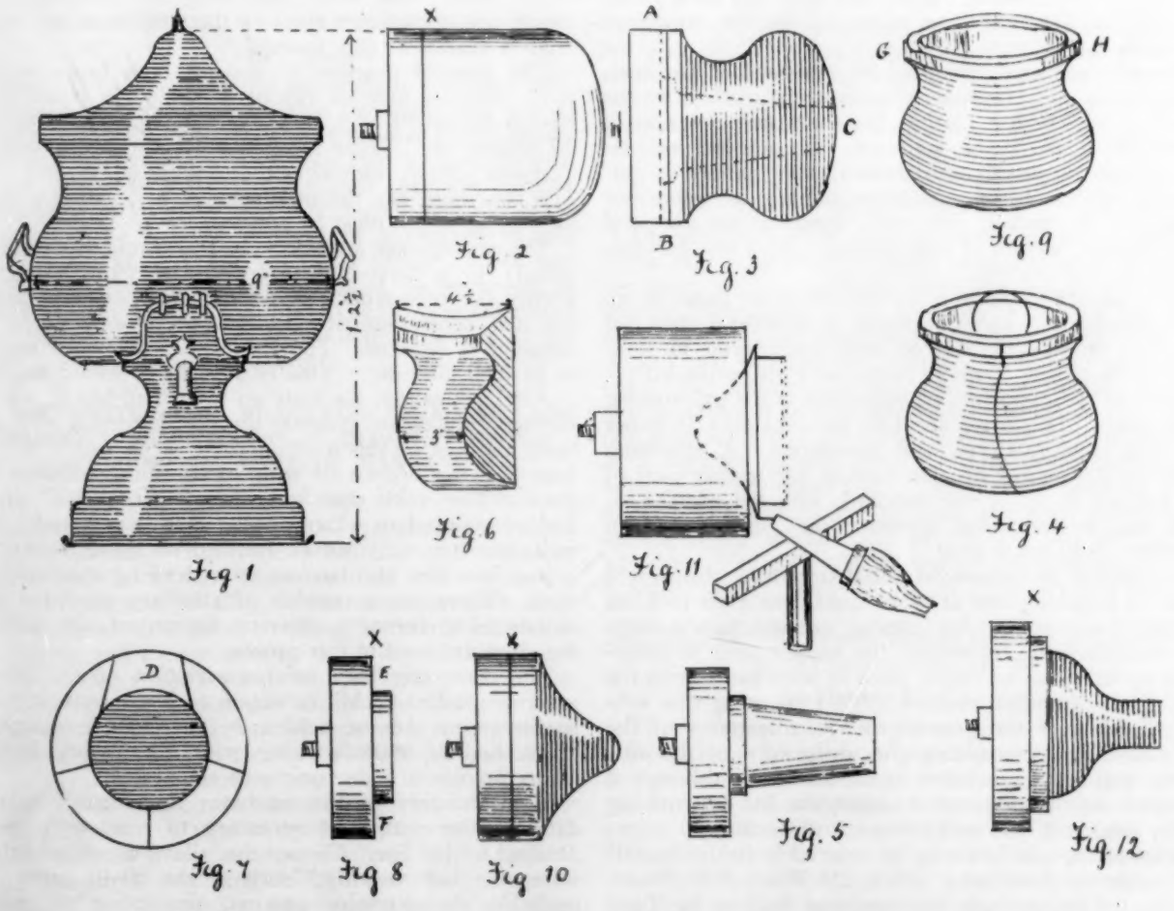
By WILLIAM MASON

Metal Spinner, Liverpool, England

A Detailed Description of the Practical Shop Operations Involved in Making Copper Tea Urns of Spun Metal—Specific Illustrations Covering Each Operation

THE tea urn illustrated by Fig. 1 is intended to be spun in four pieces out of 0.040 in. copper. The body should be spun first, the chuck (which should be of boxwood or lignum-vitæ, as it has afterwards to be turned for section chuck) being turned as shown by Fig. 2. (In the chucks illustrated, x denotes end of spinning.) After spinning down on this, turn the same chuck to the exact shape of the pattern shown by Fig. 3, but a shade smaller, so that when the metal is spun on it will be the same size as the pattern. A hole will have to be cut inside as shown by the dotted lines, Fig. 3. It will not be possible to finish turning this hole on the chuck, so when it has been turned as near as can be, get a very fine saw and saw through the wood from A to B; part of this can be turned away with turning tool. The end of the chuck marked C should now be put on a small chuck and the hole finished, when it will appear similar to Fig. 4. Then get another piece of boxwood, and turn it to fit in the hole just turned in Fig. 3; this is called a peg chuck, Fig. 5.

The section chuck must now be cut in pieces. Screw it in a vise with the hole opposite, and use a very fine saw. The first piece cut out is called the key, and is shown by Fig. 6. It will be noticed that this piece is larger across the inside than the outside, so that when the metal is spun on to the section chuck and taken off the peg chuck, this key will spread out into the hole inside—hence the name "key." If all the pieces of the section were cut straight across, the saw being held perpendicular, when the metal



Design of Chucks and Spinnings for a Copper Tea Urn

was spun on it would appear as if in one solid piece, and it would be impossible to take out the pieces without destroying the section. After cutting the key, holding the saw at an angle sufficient to cut to the sizes shown in Fig. 6, divide the remainder of the chuck with a pair of compasses into four equal parts, and cut with the saw, holding it perpendicular. The end of the section chuck is shown by Fig. 7, D being the key. In sawing up the sections, be very careful to cut the pieces smaller than the diameter across the smallest part of the neck of the spinning, or it will be impossible to take off the spinning when finished. Fig. 4 shows the whole section, the mark indicating where it should be sawn. Now take up the piece of work which has been spun, Fig. 2; put the five pieces of the section in it, and put it on the peg chuck, where the parts should hold together in one solid piece. Put a centre-wood against it, and commence spinning from this, gripping the metal to the chuck immediately spinning is begun. When spun a little more than halfway, it will require annealing, after which spinning may be resumed. It will now go down on the chuck quite easily, but will be bruised from the nicks between the pieces of the section; this may be easily remedied by taking the spinning off the peg chuck and turning the section round slightly with the hand, then burnishing over again with the spinning tool. The part is now ready for soldering to the bezel, which is the next part to be spun.

Turn the chuck as in Fig. 8, and spin down; cut out the centre, and pull out as shown by the dotted lines. The diameter from E to F should be ¼ in. more than from G to H, Fig. 9. The bezel having been soldered to the body with tinman's solder, and the small flange and superfluous solder turned off, it will appear as in Fig. 9. For the lid, turn the chuck as in Fig. 10, and spin down; then turn an inside chuck as shown by Fig. 11, so that the lid may be spun to fit the bezel, spinning in as shown. To spin the foot, turn the chuck as in Fig. 12, and spin down; three annealings may be necessary to get it on the chuck. Then lap on the edge to form a "wire," cut out the centre, turn away ½ in. of the front of the chuck, and pull out with hook tool as shown by the dotted lines, Fig. 12. A faint line should be drawn on the bottom of Fig. 9 to enable the foot to be soldered on true, and the two parts joined together. The handles, tap, and knob will have to be bought. Handles on a tea urn must be very firm; make sure when buying them that they will screw from the inside. The urn is now ready for polishing.

Zinc Coatings for Structural Steel

The American Tentative Standard, Zinc Coatings on Structural Steel Shapes, Plates, and Bars and their Products (G8c-1930), has been approved by the American Standards Association.

The standard was submitted for approval of the association under the proprietary sponsorship method by the American Society for Testing Materials, as a revision of a previous A. S. T. M. standard. It includes designations of specific grades of structural steel, grades of galvanizing spelter bath, maximum amount of impurities allowed in the molten zinc bath, specifications for steel embrittlement, weight of zinc coating, and a test for uniformity of zinc coating.

The standard departs from the previous issue in no longer designating specific grades of structural steel but permitting instead the use of steel conforming to standard specifications. Definite limits were also provided for the permissible proportion of impurities in the galvanizing spelter bath. The limits are 1.60 per cent lead, 0.08 per cent iron, and 0.01 per cent aluminum. A minimum weight of 2.0 ounces of zinc coating per square foot of strip surface is set in the standard, with the added provision that no individual specimen shall show less than 1.8 ounces per square foot.

The method recommended for determining the weight is that of weighing one or more specimens after pickling and drying and again after coating, or inspection is made after manufacture. However, the weight may be determined by stripping an entire piece in accordance with the A. S. T. M. standard method (A90) covering this subject. Because of the general use by consumers of the Preece test for determining the uniformity of the zinc coating, that test is included in the standard, although it is pointed out that the test is inadequate for determining weight, thickness, or uniformity of the coating.

Copies of the standard may be ordered from the American Standards Association office, 29 West 39th Street, New York City, or from the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

Manufacturing Brass Rod

The method of manufacturing small-diameter rod of "high brass"—the alloy containing approximately two-thirds copper, balance zinc—is the subject of an inquiry from a reader of this journal.

The general practice in making high brass rods or wire, consists, first, of casting the alloy in round billets having diameters of 1¼ to 2 inches, and weighing from 50 pounds up. These are generally cast in the so-called "cannon" mold, although the box mold is still used. The box mold has the disadvantage of leaving a fin on the casting which must be removed.

The castings are annealed and then broken down (cold rolled) in a three-high grooved rod mill. A ten to twenty per cent reduction can be made before re-annealing, the percentage of reduction decreasing as the rod diameter is reduced. The rods are coiled when reduced to ¾ inch diameter. This is done by a coiling machine.

After annealing, the coils go to a "bull block" and are further reduced by drawing through hardened steel dies, being reduced on this machine to ½ or ⅜ inches in about four drawing operations with an annealing between each draw. The work then goes to a "wire block" and is further reduced to whatever diameter is required. 1/16 inch diameter wire can be handled on these blocks.

For fine wire the tandem wire drawing machines are used. There are a number of auxiliary machines such as annealing furnaces, cleaning equipment, die reamers, etc., that are used in this process.

The foregoing is a brief description of the general practice used in "cold" reduction of brass rods, but does not mean to propose arbitrarily any definite equipment or method of manufacturing wire, as varying requirements involve a wide variety of equipment.

Manufacturers of the machines can furnish valuable data on the equipment necessary to meet any specific demand in this line. Copper-zinc alloys which lend themselves to "hot working," such as the 60-40 group, are made by the extrusion process, eliminating the rolling entirely.

W. J. Pettis.

The Electrochemists at Birmingham

Experts from Europe and Japan at Annual Convention Discuss Silver That Does Not Tarnish, New Vacuum Tubes, Chromium-Plated Aluminum Ware, Acid-Proof Tungsten Plate.

THE twenty-ninth annual convention of the Electrochemical Society was held at Birmingham, Ala., April 23, 24 and 25, 1931. Delegates from all over the world were there to discuss the latest accomplishments of the electric furnace industry, the electron or radio tube art, and the refining and plating of metals by electricity.

The final session, scheduled for Saturday, April 25th, was presided over by Professor A. Kenneth Graham of the University of Pennsylvania, and was concerned with the electrodepositing of metals and alloys. W. Keitel and H. E. Zschiegner of the Baker Platinum Works, Newark, N. J., described the new art of platinum and palladium plating. Professor S. Glasstone of Sheffield, England, reported upon the plating of the noble metals in England. Dr. Harold K. Work and Charles J. Slunder of the Research Laboratories of the Aluminum Company of America demonstrated how hard, corrosion-resistant chromium could be plated directly on aluminum, thereby protecting the aluminum against ordinary abrasion and alkali corrosion. Ernest R. Canning of Birmingham, England, described at length the high-speed nickel plating process used in England. How tungsten, the metal composing the filament of the incandescent lamp, may be electroplated on brass and other metals was revealed to the public for the first time by Professor Colin G. Fink and Dr. F. L. Jones of Columbia University.

Abstracts of Papers

DEBISMUTHIZING LEAD WITH CALCIUM

By Ralph F. Cohn

Desilverized lead containing one-tenth to one-third of a per cent of bismuth is not suitable for white lead manufacture. The Betts' electrolytic lead process for the elimination of the bismuth is applicable, but the new process herewith presented is more economical. Metallic calcium is introduced into molten lead. A calcium-bismuth dross is formed. The bismuth in the lead is reduced to less than 0.05 per cent, and the last traces of As, Sb, Ag and Cu are scavenged. The slight excess of Ca remaining in the lead is removed with chlorine. The dross is submitted to the Betts' process. The theory and economics of the new process are discussed at length.

THE COMPOSITION OF MANGANESE AMALGAM AND MANGANESE-SILVER ALLOYS IN RELATION TO THE ELECTRODE POTENTIAL OF MANGANESE

By Harvey D. Royce and Louis Kahlenberg

Four manganese-silver alloys were prepared from highly purified materials. Electrode potentials and replacing power of these alloys have been measured. The replacing power and potential of alloy D (31 atom. per cent Mn) were correlated with alloy structure by means of photomicrographs and thermal diagrams. None of the manganese-silver alloys yields electrode potential approaching that of manganese amalgam. Manganese amalgam consists of solid Mn_2Hg_5 in equilibrium with a very dilute solution of manganese in mercury (0.0032 per cent Mn). The behavior of manganese amalgam in contact with manganese salt solutions has been interpreted on the basis of these figures. A new compound of manganese and mercury, isolated from the dilute amalgam by the application of pressures exceeding 150,000 pounds per square inch (10.500 kg./sq. cm.) and having the formula MnHg, is described. MnHg constitutes the stable solid phase in the system manganese-mercury at temperatures between 86° and 100° C. Pressure-concentration curves are presented to justify the assumption that the solid phase obtained by pressure is MnHg contaminated with a small percentage of the liquid amalgam.

ELECTROTHERMIC ZINC

By A. Walter

The development of electrothermic zinc during the past thirty years is briefly reviewed, emphasizing in particular the many difficulties to be overcome before the process became commercial. The smelting is carried out in an arc furnace of the Heroult type. The operation is continuous and comparatively simple. The zinc vapors pass out of the furnace and into a condenser, from which the zinc is tapped at regular intervals. The crude zinc (93-95 per cent Zn) thus produced is refined by resublimation in a separate electric furnace. The final product averages 99.85 per cent zinc. The process outlined is applicable to all kinds of zinc ores, and high recoveries of accompanying metals such as Cu, Pb, Au and Ag are possible. The total electric energy consumption amounts to 5,600 kw.-hr. per 1,000 kg. of 99.85 per cent slab zinc.

THE RELATION BETWEEN THE HYDROGEN OVERVOLTAGE AND COMPOSITION OF BRASS

By M. deKay Thompson

The hydrogen overvoltages on brass are measured for compositions varying from pure copper to pure zinc. The points on the overvoltage-composition plot would lie nearly evenly distributed about a straight line drawn between the values for pure copper and pure zinc, except for a decided minimum in ϵ-brass. Maxima have been found in other alloys, but this is the first sharp minimum. There is no close connection of the overvoltage with the equilibrium diagram.

HIGH SPEED NICKEL PLATING AS PRACTICED IN ENGLAND

By Ernest R. Canning

In England current densities of 2.2 amp./sq. dm. and over are used. Continuous filtration of the electrolyte, kept at 32° to 35° C., is necessary to eliminate suspended foreign matter and pinholes. Due to considerable loss in throwing power, the author advises against very high current densities. The preferred pH is 5.6 to 5.8. The cathode efficiency is 96 to 97 per cent. A plate 0.001 in. (0.025 mm.) thick is obtained in 45 minutes, with a variation in thickness of not more than 45 per cent. For adequate protection of the steel, a nickel plate of at least 0.001 in. is necessary. For sub-tropical countries composite deposits of nickel-copper-nickel are recommended.

A NEW ABNORMALITY IN THE PROPERTIES OF AQUEOUS SOLUTIONS OF CADMIUM SALTS

By Elmer Tesche and Pierre J. Van Rysselberghe

Electrolysis of aqueous solutions of cadmium iodide yields cathode deposits containing a large amount of adsorbed cadmium iodide. Cadmium bromide behaves in the same way, while cadmium chloride yields normal deposits of pure cadmium. The phenomenon is ascribed to the adsorption of neutral molecules. An explanation for the difference of behavior of the iodide and the bromide on one hand, and of the chloride on the other hand, is suggested.

THE LIMITING CURRENT DENSITY IN THE ELECTRODEPOSITION OF NOBLE METALS

By S. Glasstone

The literature of electrochemistry does not appear to contain a simple equation permitting the calculation of the maximum, or limiting, current density at which a metal can be deposited with 100 per cent current efficiency Such an equation is now developed on the assumption that the maximum rate of deposition is equal to the maximum rate at which the ions containing the metal to be deposited can diffuse up to the cathode. The values calculated in this manner are shown to be in good agreement with those observed, although discrepancies may arise when there is a possibility of hydrogen evolution.

ELECTRODEPOSITION OF PLATINUM, PALLADIUM AND RHODIUM

By W. Keitel and H. E. Zschiegner

The chloride plating bath for platinum metals is not satisfactory due to its short life. A new bath was accordingly developed in which the platinum is present as the di-amminonitrite. Good, bright adherent deposits are obtained. The throwing power is very good. A similar bath for palladium was likewise developed and has given very satisfactory results.

THE ELECTRODEPOSITION OF CHROMIUM AND THE INFLUENCE OF THE CATHODE METAL

By J. W. Cuthbertson

In chromium plating the best results and greatest flexibility and reliability in operation are obtained from a solution of chromic acid and sulfuric acid. The molarity of the CrO_3 should not be greater than 3.25, and the ratio of this to SO_4 normality should be about 58 to 60. The tank should be lined with hard lead, the lining *not* being anodic to the solution except as a temporary measure. Lead is the only material that can be considered for anodes. The temperature should be reasonably high, but not above 45° C., as then the Cr^{III} equilibrium concentration reaches too high a figure. Care should be paid to the ratio between anode and cathode surfaces. The anode area should be 1.5 to 3 times that of the cathode, and anodes should be disposed with respect to the cathode size and shape. Even under the best of conditions, the cathode current efficiency is not above 16 per cent. The nature of the cathode is of the greatest moment. It should be of a metal of high hydrogen overvoltage corresponding to that of chromium. Nickel is the material mostly used now, but is far from ideal. For many purposes copper is a far better undercoating. It is impossible to increase materially the throwing power of chromic acid solutions. The best way to improve upon existing conditions is to increase the plating range in which bright plate is obtainable. Except in the case of copper, little success has been obtained from chromium deposits direct on the base metal. This may be due to the inherent porosity of these deposits. Direct deposits can be improved by heat treatment, but this does not lend itself readily to commercial practice.

BRIGHT SILVER PLATING FROM THE CYANIDE BATH

By L. C. Pan

Ammonium hydroxide added to a silver plating bath has a whitening effect upon the silver deposit, especially when the bath contains an appreciable amount of impurities which otherwise cause discoloration of the cathode deposit. Sodium thiosulfate added to the extent of 1 g./L. makes the silver deposit almost of mirror brightness. The combination of ammonia and sodium thiosulfate gives a still more effective brightener for the silver deposits from a cyanide bath.

CHROMIUM DEPOSITS DIRECTLY ON ALUMINUM

By Harold K. Work and Charles J. Slunder

Thin layers of chromium which have fairly good resistance to salt spray and atmospheric corrosion may be electrodeposited directly on aluminum. Such deposits have a gray color on leaving the plating bath and must be buffed if a higher luster is required. These deposits protect aluminum to a marked degree from alkaline corrosion. Heavy deposits for abrasion resistance have also been applied to certain aluminum alloys.

PROGRESS OF THE HOT NICKEL SOLUTION

By Oliver P. Watts

A report is made of the volume and operating conditions of many of the hot nickel plating solutions now in use in the United States and Canada. Since there was an incubation period of five years between the announcement of the advantages of heating the nickel plating solution and its commercial adoption, the reported growth to 158,000 gallons has occurred in ten years. Opinions of platers on the respective merits of the hot and cold nickel solutions are included.

ELECTRODEPOSITION OF CHROMIUM-IRON ALLOY

By G. Fuseya and K. Sasaki

Experiments were performed to find the best conditions of electrodepositing chromium-iron alloys containing more than 16 per cent chromium. A chromic acid bath for chromium plating, with iron salts added, did not give any good deposit of the alloy, and, therefore, sulfate baths containing from 52 to 130 g./L. Cr, 7 to 30 g./L. Fe and 0.05 to 0.1 molar in H_2SO_4, were electrolyzed between Cu cathodes and magnetite anodes. It was found that the longer the duration of electrolysis the lower the Cr content of the deposit. The higher the current density, and the lower the temperature or the acidity of the bath, the higher the Cr content of the deposit. A search of the lit-

erature indicated that no previous work had been done on the electrodeposition of this alloy.

AN EXPERIMENTAL STUDY OF METAL POLISHING BY FLEXIBLE POLISHING WHEELS

By Edwin M. Baker and George E. Holbrook

This paper describes the apparatus which was designed and built at the University of Michigan for the experimental study of metal polishing by flexible polishing wheels, outlines the general procedure of the laboratory tests, and presents experimental data which were obtained in a study of the following problems: The determination of the effect of variations in pressure upon the performance of the wheels; the determination of the effect of variations in grain screen analysis and glue concentration upon performance; the determination of the changes of performance of a wheel as it is used in the polishing process; and the determination of the effect of applying a thin film of glue to the periphery of the wheels after all the grain has been applied.

THE CHANGE IN REFLECTING POWER CAUSED BY TARNISHING ELECTRODEPOSITED SILVER-CADMIUM ALLOYS

By Lawrence E. Stout and William G. Thummel

Silver-cadmium alloys may be deposited from a commercial cadmium plating bath to which silver cyanide has been added. The composition of the alloy depends on the silver concentration in the bath (if the cadmium content remains constant) and on the cathode current density. The co-deposition of silver lowers the reflecting power of electrodeposited cadium. The tarnishing of the alloys depends both on the composition and on the rate of deposition, and is materially less than that of pure silver. A silver-cadmium alloy containing about 24 per cent of silver recommends itself as the best general purpose reflector. Its reflecting power is equal to that of pure cadmium, and it is considerably harder and more resistant to abrasion than pure electrodeposited cadmium.

CONTROL OF ACIDITY IN LOW pH NICKEL PLATING BATHS

By L. C. Pan

For the control of acidity in low pH nickel plating baths, the titration method, including a "control chart" for direct readings, was found to be most practical in a commercial plant. It is based upon the assumption that for a given bath whose composition being kept approximately constant, the pH value will be the same as long as the acidity is maintained at the same point. The "control chart" also provides a direct method of regulating and correcting the acidity or pH, eliminating all labor of computation and all guesswork.

THE ELECTRODEPOSITION OF TUNGSTEN FROM AQUEOUS SOLUTIONS

By Colin G. Fink and Frank L. Jones

A method has been developed for the electrodeposition of metallic tungsten from aqueous solutions. The tungsten deposit is smooth, hard and coherent, having a high luster. Like chromium, the electrodeposited tungsten needs no polishing if the plated article was previously polished. Tungsten has remarkable acid-resisting properties, which make it desirable as a protective coating for other metals. Several types of solutions have been investigated in regard to their usefulness as tungsten plating baths. Solutions of tungsten salts in organic solvents were found unsuitable for this purpose. Aqueous solutions of an acid nature did not give satisfactory metal deposits. Alkaline solutions containing alkaline tungstates were preferably used as plating baths. The temperature, cathode current density, and hydrogen ion concentration of the solution must be controlled. Alloys of tungsten and iron, and of tungsten and nickel, were electrodeposited from similar solutions containing very small concentrations of the ions of these second metals. The usefulness of highly alkaline solutions as plating baths for the electrodeposition of other metals is pointed out.

THREE CRYSTALLINE MODIFICATIONS OF ELECTROLYTIC CHROMIUM

By Kumazo Saski and Sinkiti Sekito

X-ray spectra were made of chromium electrodeposited from acid chromic sulfate solutions. At current densities below 15 amp./sq. dm. the body-centered cubic form is deposited; above 18 amp./sq. dm. the hexagonal close-packed form; and at intermediate current densities both the cubic and the hexagonal modification are deposited. The effect of bath temperature is very apparent. At 20° C. or below the hexagonal form was obtained; at 26° C. the body-centered cube only. Chromium plates made from chromic acid baths were always cubical with a lattice constant equal to 2.877 ± 0.003 A. The hexagonal modification is gradually transformed into the cubic even at room temperature.

A STUDY OF SILVER PLATING SOLUTIONS

By B. Egeberg and N. Promisel

A discussion is given of the effects of temperature, current density, and concentrations of silver, cyanide, carbonate, and carbon disulfide on the resistivity, throwing power, and cathodic and anodic polarization in argento-cyanide plating solutions. Curves are given to illustrate these effects. A comparison is made between solutions containing sodium salts and those containing potassium salts, and the advantages of the latter pointed out. Optimum plating conditions and compositions for above solutions are suggested. The subject is treated mainly from the industrial standpoint, although theory is also briefly considered where possible.

ELECTRODEPOSITION OF SILVER FROM SULFATE, NITRATE, FLUOBORATE AND FLUORIDE SOLUTIONS

By Edward B. Sanigar

The possibility of electrodepositing silver in a form suitable for electroplating purposes from silver sulfate, nitrate, fluoborate and fluoride solutions has been studied. Owing to the simple-immersion deposition of silver from these solutions upon copper, mercury, brass and nickel, adherent deposits were obtained only upon silver. Relatively compact deposits of silver were obtained upon silver deposited from an argento-cyanide solution, from silver sulfate solutions containing boric acid or ferric sulfate, silver nitrate solutions containing boric acid, silver fluoborate solutions and silver fluoride solutions. However, these solutions showed a great tendency to yield treed deposits, and the conditions under which deposits free from trees could be obtained were limited. All the compact deposits were decidedly crystalline, and while they might be of use in the electrorefining of silver, as a means of obtaining dense silver deposits instead of the loose crystals given by the nitrate solution, they offer no serious competition to the usual argento-cyanide solution for the electroplating of silver, unless considerable improvement can be made, for example, by the use of "addition agents." A further difficulty in the way of the use of these baths for silver deposition is unsatisfactory corrosion of anodes.

For abstracts of other papers see page 209.

Gold Solutions

By OLIVER J. SIZELOVE
Associate Editor

A Detailed Description of the Three Different Solutions for Electrodepositing Gold

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, APRIL, 1931

GOLD is one of the most malleable and ductile metals, and readily alloys with most metals. When pure, it is of a yellow color, becoming pale by the addition of silver and red by the pressure of copper.

Pure gold does not tarnish and is not attacked by any of the single acids (selenic acid being excepted). It is readily soluble in aqua regia; a mixture of hydrochloric and nitric acids, two parts of hydrochloric and one part of nitric acid being the combination which is generally used. It is also to some extent soluble in potassium or sodium cyanide. This fact is applied in the cyanide method of extracting gold from its ore.

No other metal lends itself to the variety of shades or color as does deposited gold. There is no set standard of weight for the metal deposited as there is with silver, and the least amount of gold that is used to produce a satisfactory color, especially on novelty and cheap jewelry work where competition is close, is quite an item in the cost of the article. The operation as usually practiced is to produce a satisfactory color as an ornamental finish, and then to protect the finish by the use of lacquer.

The three different methods of depositing gold that are in general use are (1) the cyanide method, (2) the salt water method, and (3) the immersion method.

Cyanide Method

When the deposit is to be of any specified thickness or wearing qualities, the cyanide gold solution is always used. The gold may be introduced into this solution either as the fulminate of gold or as gold cyanide. Besides a small amount of free cyanide which is necessary, sodium phosphate is added as a conductor. The amount of metal that is used in the solution varies greatly and is usually governed by the character of the work being done.

The following formula is the one that can be used on all classes of work by increasing the metal concentration as desired:

Metallic gold (as fulminate or cyanide)	.5 pwt.
Sodium or potassium cyanide	.2 ozs.
Phosphate soda	.1 oz.
Water	.1 gallon

The color of the deposit varies greatly by the temperature and current density used; also by the metal concentration and the free cyanide content.

It is possible to obtain from this solution a pale 16 karat color to a rich yellow 24 karat color by changing the temperature and current density. If operated at room temperature and a low current density, a pale 16 karat color is produced. If operated at 130° F. and the current density is increased, a good yellow color is produced. If the temperature is increased to 175° F., a red color is obtained.

In gold plating novelty work when only a flash of gold is desired for "color," the cyanide of gold solution has not proved as satisfactory in some cases as either the salt water or immersion methods. It can be readily seen from the remarks on cyanide gold solution that careful adjustment of the temperature, current density, metal concentration, and the free cyanide content of the solution must be maintained constant at all times to produce uniform results.

Salt Water Method

The salt water gold method is recommended for most novelty work, for less difficulty is had in producing a uniform color, as there are less factors to be controlled with this method of gold plating. The salt water gold solution is simple to make, easy to operate, and very little care is required in its operation. More work can be produced from this solution at less cost than with the cyanide solution.

With this method the gold solution is placed in a porous pot which is surrounded by a cylinder of zinc and placed in a tank which contains a saturated salt (sodium chloride) solution.

The salt water is heated to 150° to 175° F., and if steam is used, the coil should be made of brass or copper tubing. If gas is used to heat the salt water solution, the tank that holds the salt water solution should be made of copper.

An upright bar is fastened to the zinc cylinder to which is attached a cross rod upon which the work is suspended into the gold solution.

An electrolytic action is produced by the action of the salt water on the zinc, and thus furnishes the electromotive force by which deposition of gold takes place. In other words, the gold is precipitated out of the solution and on to the work by being in contact with the zinc cylinder.

There are different variations in the amount of chemicals that are used in preparing the gold solution, and it does not seem to matter greatly what the proportions are, for little trouble is had so long as the solution is replenished with gold from time to time.

The following formula is used with excellent results:

Potassium Ferro cyanide	16 ozs.
Sodium phosphate	8 ozs.
Sodium carbonate	4 ozs.
Sodium sulphite	2 ozs.
Gold as fulminate .....3 to	4 pwt.
Water	1 gallon

The chemicals and gold with a small amount of water are placed in an enameled vessel, and boiled for at least an hour before placing in the porous pot and diluting with water to the proper volume.

In replenishing the solution, the same amounts of gold and chemicals are taken and boiled thoroughly and added to the solution. A red deposit is an indication that the solution has become depleted in metal, and it is then necessary to replenish the gold solution.

When the solution works slow, it is usually found that the salt water solution has become weak and more salt should be added. The salt water should be kept at a Beaume reading of 12° to 15°.

Too much gold should not be added at one time, as this will cause a smutty deposit: so will the use of too high a temperature. 140° F. is an ideal temperature at which to operate the gold solution.

It might be well at this time to give method of preparing the "fulminate of gold."

A weighed amount of gold is taken, preferably ribbon gold which is cut into small pieces and to each ounce of gold 8 fluid ounces of aqua regia (2 parts hydrochloric acid and 1 part nitric acid) are used. Put the gold and acid into an evaporating dish and place on a hot water or sand bath under an exhaust hood and let the gold dissolve. When the gold is dissolved, it is diluted with water and 26° ammonia hydroxide which is diluted one half with water, and added until the gold is precipitated. This is indicated by the faint odor of ammonia, or by the blue reaction of red litmus paper. The precipitate is allowed to settle and the clear solution siphoned off. More water should be added and siphoned off until the odor of ammonia has been removed. After the last siphoning operation, the gold fulminate is placed in a bottle until ready for use.

As fulminate of gold is explosive when dry, it should at all times be kept covered with water when placed in the bottle.

Gilding by Immersion

Gold is a very electro-negative metal so that any of the common metals are capable of replacing it when in solution. It can therefore be deposited by simple immersion, and this fact is made use of when a very thin film of gold is desired. It is used mostly on the cheapest class of gold plated work, and when properly done presents quite a pleasing finish.

The solution is prepared from the following chemicals:

Yellow prussiate potash	24 ozs.
Carbonate soda	12 ozs.
Caustic soda	¼ oz.
Sesqui chloride iron	⅛ oz.
Gold as fulminate	3 pwt.
Water	1 gallon

If the deposit is too light in color, which is usually the case when the solution is first prepared, the addition of a small amount of copper cyanide that is just taken up with sodium cyanide will darken the color of the deposit. There should be no free cyanide in the solution.

The required amount of chemicals and water are placed in a cast iron tank, preferably of the steam jacketed type, and boiled for an hour or so. The solution is then cooled to 140° to 150° F., at which temperature the solution operates best. Large quantities of small work can be done in this solution, and an even deposit is obtained.

When the color of the deposit becomes too red and the solution works slowly, it should be replenished by adding fulminate of gold and boiling for an hour or so before using.

The solution, when first prepared, will register 15° Beaume. When the reading is 12° Beaume, the solution should be replenished with chemicals using ¼ of the amount given in the formula.

Green Gold

Green gold deposits which are usually an alloy of gold and silver, although cadmium has been used in the place of silver in some instances, are best prepared from the cyanide of the metals. The porous pot method can also be used, and this consists of making a cyanide solution of 4 ozs. of sodium cyanide and water 1 gallon, which is to be used as the plating solution. Green gold anodes of the proper alloy are hung on anode rod and a porous pot that contains a cyanide solution is attached to the cathode rod, and into the porous pot is suspended a copper cathode. Electrolysis is employed, and the anodes are taken from the solution and weighed from time to time so as to determine when the proper amount of gold has been taken from the anode and put into the solution.

Green gold solutions are best operated at a temperature of 95° to 100° F. The temperature plays quite an important part in producing the desired shade of color. A rise in temperature will increase the percentage of gold in the deposit. A low current density and a low free cyanide content also aids in producing a deposit that is more yellow.

The operating conditions of a green gold solution are similar to those of a brass solution, for the factors that tend to deposit a high copper alloy will also produce an alloy in which the gold is high.

Green gold deposits can also be obtained with the salt water type of solution.

When the silver is added to a salt water gold solution, the silver in the form of a chloride should be put in the solution by boiling with yellow prussiate of potash and then added to the solution.

In preparing cyanide green gold solution 5 to 6 pwt. of metallic gold, either as fulminate or cyanide, is used to each gallon of solution, and two ounces of sodium cyanide is enough to put the metal into solution and also give a free cyanide content that is sufficient. The silver as silver cyanide should be added cautiously until the desired shade of color is had.

Antique green gold solutions are produced by adding a lead or arsenic salt to the green gold solution. The lead salt is preferred, and it is taken up with caustic soda, and then added to the solution in small quantities.

Antique green gold solutions are operated with quite a high free cyanide content, and also a high current density; 5 to 6 ounces of free cyanide being used with 4 to 6 volts pressure.

White gold and 14 karat gold solutions are prepared by adding to the cyanide gold solution nickel or copper respectively, in the form of cyanide until desired color is obtained.

Rose gold solutions are fine gold solutions to which caustic soda or potassium carbonate or both are added in sufficient quantities to produce a smut effect with the deposit. The highlights are relieved with bicarbonate of soda, leaving the rose or smut effect in the background. The effect is very pleasing when properly done.

Analyzing Chromium Solutions

By I. L. NEWELL and W. H. KEEFE

The Henry Souther Engineering Company, Hartford, Connecticut

A Method for the Complete Analysis of Chromium Plating Solutions Including Metals Other Than Chromium

IT is well-known that successful deposition of chromium from chromic acid plating baths can only be accomplished when the factors affecting the plating range are closely held to the desirable conditions. Control of the chemical composition of the solution is one of the most important factors.

The adoption of chromium plating on a commercial scale has made necessary the development of methods for the chemical control of solutions, and several methods (Haring and Barrows—Bur. of Standards Tech. Paper 346), (Schneiderwind—U. of Mich. Engineering Research Circular No. 3) are now in use for the determination of chromium and sulfates. The method adopted by the writers for the determination of chromium and sulfates are based on the methods of Haring and Barrows Schneiderwind, and Blufn and Hogaboom, with slight modifications, to decrease the time required for analysis.

It has been shown by several investigators (Schneiderwind—U. of Mich. Engineering Research Circular No. 3), (Pinner and Baker—Trans. Am. Electrochemical Society 55, 315) that the presence of trivalent iron in certain concentrations exerts an influence on the behavior of chromium plating solutions, and more recently it has been shown (Stout and Carol—Industrial and Engineering Chemistry 22, 1324) (Alter and Mathers—Trans. Am. Electrochemical Society 56, 363) that other metals affect the plating range during the electrolytic deposition of chromium.

The method developed by the writers for the determination of the metal contents of chromium plating solutions has been deemed simple enough to be adopted as a routine method, and is of sufficient accuracy to be valuable in the control of chromium plating solutions.

The method adopted depends on the reaction between lead salts and chromic acid to form lead chromate. This is a very insoluble salt, solubility .0002 grams per liter at 18°C. in distilled water (Kohlrausch—Z. Physik Chem. 50, 365). Moreover, the characteristics of the salt are such that subsequent filtration and removal from the solution are easily effected. As nearly all of the chromium in a chromium plating bath is present as chromic acid, it may be easily removed from the solution by precipitation as lead chromate. The chromic salts present are not precipitated as lead chromate, but remain in solution. They are easily oxidized to chromates and separated from iron, copper, nickel, etc., by the use of sodium peroxide.

Details of the methods follow:

Sulfates

Filter a portion of the sample through a dry asbestos mat. Pipette a 10 ml. portion of the filtrate into a 250 ml. beaker and add 20 ml. water, 7 ml. concentrated hydrochloric acid, 25 ml. glacial acetic acid and 15 ml. ethyl alcohol. Boil for a half hour, and add water to make 150 ml. Heat to boiling and add 10 ml. 10% barium chloride solution. Let stand in a warm place for at least two hours, and filter through a close paper. Wash thoroughly with hot water, ignite and weigh barium sulfate.

Hexavalent Chromium (Chromic Acid)

Pipette a 1 ml. portion of the sample into a 600 ml. beaker. Add 400 ml. water, 5 ml. 85% phosphoric acid, and .6 to .8 ml. .1% solution of diphenyl benzidine.* After standing a few minutes add 3 grams sodium acetate crystals and titrate with .2 normal ferrous ammonium sulfate to the disappearance of the blue color.

Trivalent Chromium

Pipette a 25 ml. sample into a 250 ml. beaker, dilute to approximately 200 ml., neutralize with ammonia, and add a slight excess. Heat to boiling, and continue to boil for about one minute, then filter on a rapid paper and wash well with hot water. Dissolve the precipitate with hot dilute sulfuric acid, and reprecipitate with ammonia. After washing this precipitate with hot water, redissolve in hot dilute sulfuric acid, cool, and add an excess of sodium peroxide to the solution. Boil this solution for several minutes, then filter on a rapid paper, and wash well with hot water. A second reprecipitation and treatment with sodium peroxide is sometimes necessary. The filtrates from the iron precipitate contain the oxidized trivalent chromium. They are combined, acidified with sulfuric acid, and boiled to remove the hydrogen peroxide formed. The solution is then treated as given under Hexavalent Chromium.

Copper

Transfer 10 ml. of the sample into a 400 ml. beaker, and dilute to about 200 ml. with water. Heat to boiling and add an excess of a saturated solution of lead nitrate. As the precipitate formed settles rapidly it is readily apparent when precipitation is complete. Filter and wash well with hot water. Discard the precipitate of lead chromate. Treat the filtrate with sodium peroxide until the solution is alkaline, then add a slight excess. Boil for a few minutes, and then filter, washing the precipitate well with hot water. Save the filtrate for zinc determination. Dissolve the precipitate in a small amount of hot hydrochloric acid, and repeat the treatment with sodium peroxide. This should remove all but traces of chromium. The precipitate is washed with hot water, and redissolved in hot

*Dissolve .1 gram diphenyl benzidine in 10 ml. concentrated sulfuric acid and add 90 ml. glacial acetic acid.

dilute hydrochloric acid. Add 10 ml. concentrated sulfuric acid, and evaporate to white fumes. Dilute with water to approximately 75 ml. and let stand to allow the lead sulfate to settle. Filter off the lead sulfate precipitate, wash with dilute sulfuric acid, and pass hydrogen sulfide through the filtrate to precipitate copper sulfide. Filter the copper sulfide from the solution, and save the filtrate for iron, nickel and zinc determinations. The copper sulfide can be dissolved in nitric acid, and the copper determined electrolytically.

Iron

The filtrate from the copper sulfide precipitate contains the iron. Boil to remove hydrogen sulfide. Oxidize with a few ml. of nitric acid. Add 3 to 4 grams of ammonium chloride to the solution, and then a slight excess of ammonia. Bring the solution to a boil, and after a minute, filter the ferric hydroxide precipitate on a fast paper, and wash well with hot water. Save the filtrate for the determination of nickel and zinc. The iron may be determined gravimetrically by burning the ferric hydroxide precipitate, or it may be dissolved in sulfuric acid and estimated volumetrically.

Nickel

Make the filtrate from the ferric hydroxide precipitation slighly acid using acetic acid, heat to boiling and then add an excess of dimethyl glyoxime solution. Neutralize with ammonia and filter the precipitate on a weighed Gooch crucible. Dry and weigh.

Zinc

Combine the filtrate from the sodium peroxide treatment given under copper with the filtrate from the nickel determination. Acidify with sulfuric acid using about 10 ml. in excess. Evaporate to a suitable volume and determine zinc gravimetrically as the phosphate.

Electroplaters at Newark in Annual Session

Educational Program Brings Out Good Attendance— Honorary Membership Presented to Dr. E. B. Weston

The annual educational session and banquet of the Newark Branch of the American Electroplaters' Society was held at the Elks' Club, Newark, N. J., April 11. More than 100 people were present at the session, which was treated to a good array of technical papers on various phases of the electroplating art. The discussions which followed the papers indicated the intense interest which the platers of that city are taking in the improvement of their industry and the steady progress of research in metal finishing.

The session was presided over by Phillip Sievering, well-known New York electroplater, a leading member of the Newark Branch and nationally known as treasurer of the Research Fund of the A.E.S. He introduced the speakers, who presented the following papers:

The Cleaning of Metals, by Dr. R. W. Mitchell, Technical Director, Magnus Chemical Company, Garwood, N. J.

Odd Finishes and Greens on Cadmium, Silver and Gold, by F. J. MacStoker and H. H. Levine, members of the New York Branch.

Recent Developments in Electrodeposition of Metals of the Platinum Group, by Dr. K. Schumpelt, metallurgist, Baker and Company, Newark, N. J.

Pewter: Its Manufacture and Finish, by Dr. B. Egberg, Chief Metallurgist, International Silver Company, Meriden, Conn.

Considerable discussion followed each paper, the audience asking questions which were answered by the men who presented the papers.

There was an exhibit of finished products illustrating the paper by Messrs. MacStoker and Levine, showing some very fine finishes these men have produced by methods described in their paper.

Dr. Mitchell gave a blackboard demonstration of certain phases of metal cleaning technique. He discussed the various reasons for cleaner efficiency as well as means of controlling cleaning solutions.

Dr. Schumpelt briefly described methods of producing platinum and palladium deposits. In mentioning the deposition of rhodium he stated that he was not permitted to give the details for reasons relating to patents in which his company is interested. After his talk he showed samples of silverware and other articles plated with metals of the platinum group.

Dr. Egberg's paper gave a very thorough resume of the various technicalities regarding pewter which the plater and finisher should understand in order to finish this metal properly.

Honorary Membership for Dr. Weston

George Gehling, president of the American Electroplaters' Society, was present. His chief activity during the afternoon was the presentation to Dr. Edward B. Weston, of Philadelphia, Pa., of the honorary membership in the Society which was accorded to Dr. Weston last year at the annual convention of the A.E.S. Mr. Gehling made a short address of presentation, which was followed by an address of acceptance by Mr. Mellon, who represented Dr. Weston, the latter being unable to attend due to his advanced age and unwillingness to travel very far from home. Mr. Mellon reviewed Dr. Weston's career, which has been long and very important to electroplating technique as well as other phases of electrochemistry and electrodynamics.

Banquet Well Attended

The banquet in the evening brought together more than 350 people, a great many ladies being among the guests. There was the usual fine dinner provided by the Newark Branch, and dancing after the dinner.

The Polishing of Aluminum and Brass

The Details of Producing a Bright Finish on Different Alloys.[1]

THE procedure followed in polishing non-ferrous metals such as aluminum, brass, and bronze, is somewhat different from that employed in polishing steel. In most cases it is necessary to buff these metals to obtain a highly finished surface.

Polishing Aluminum

There are three distinct types of aluminum, each of which necessitates different methods for the care of the polishing wheel in order to secure the longest life and reduce the number of passes to a minimum without leaving abrasive marks in the work too deep for the wheel following to remove. These three types of aluminum are: aluminum in sheet form, die cast aluminum, and sand cast aluminum.

Sheet aluminum has a highly finished surface after being rolled, and is used in the manufacture of deep-drawn articles. All that is required to prepare work for the buffing operations which follow is to remove the press marks. This is usually done with a wheel set with No. 120 Alundum grit, followed by No. 180. Oil and grease are essential for this operation. If the wheel is used dry, the face will become loaded and leave a mark on the work being polished as deep as the amount of metal the grain has picked up. In fact, the metal will cut itself. In most instances, a Tripoli cake, heavy in grease, is used.

Die cast aluminum is harder than the sheet aluminum. It has a smooth surface aside from the flashes left from the dies. In many cases, this class of work receives but one operation with No. 150 Alundum abrasive before being buffed. More pressure can be applied to the buff wheel on die cast metal due to its hardness.

Sand cast aluminum is generally rough ground on a dry set-up wheel with No. 80 grit, though in some cases as coarse as No. 60 grit may be used. This is followed by No. 120 and No. 150 although No. 180 and No. 240 may be used, depending on the alloys in the composition of the metal. Grease is used on all wheels after the roughing operation.

The final finish on the different types of aluminum is obtained by two buffing operations. The first is known as the cutting-down and the second the coloring up. On the first, a cake made of Tripoli is used and a cake made of Vienna lime is used for the coloring operation. The Tripoli removes the marks from the set-up wheel and the lime produces a high luster.

Polishing Brass

Every known type of polishing wheel is used in the brass industry for polishing. The type of polishing wheel used depends upon the shape of the piece to be polished. A sewed buff or canvas wheel is generally used on castings that are round or irregular in shape. This type of wheel is flexible and follows the contour of the casting. On parts that are flat, or when it is necessary to retain sharp, defined edges and corners, a hard wheel is employed. Block or wooden wheels are still being used on this class of work.

The size of abrasive used depends on the condition of the part to be polished and the finish desired. The number of operations necessary to finish a casting also depends upon these two factors.

Brass cast in sand is being successfully roughed with No. 60, 70 or 80 grit, followed by a second operation on a wheel set up with No. 150 or 180 Alundum abrasive. The second operation is usually done on a Spanish felt wheel or a sewed sheepskin wheel. The felt wheel is used on parts where a hard wheel is desirable, while the sheepskin wheel is used on parts that are round and irregular, requiring a more flexible wheel.

The second wheel is often spoken of as the oil or grease wheel. This term is used because an oil or lubricant is used for the purpose of obtaining a color and for reducing the amount of work on the buff wheel. Scratches made by a dry wheel require more time and material to remove than scratches left by an oil wheel. Grease sticks or tallow, Tripoli or emery cake are the lubricating agents that are commonly used.

In the polishing of sheet brass, No. 180 to No. 220F can be used. The type of wheel used will depend on the shape of the piece to be polished. The presence of die marks or scratches in the sheet material due to handling will determine which size should be used to best advantage. The best practice is to use the finest grain possible without reducing production. One polishing operation is generally sufficient to prepare sheet brass for the final buffing operation. A lubricant should be used here in the same manner as it is used on cast brass.

Brushed brass or satin finish is produced with greaseless compounds. These compounds are made with abrasives that vary in size, depending on the finish desired. To produce a brushed brass finish of the type found on the cheap grades of hardware, it is necessary only to rough the casting with a soft, sewed buff wheel set up with No. 80 grit, and buffed with a greaseless compound containing No. 120 or No. 150 abrasive. To produce a finer finish, it is necessary to add a second operation in the polishing process to remove the marks of the roughing wheel. A wheel set up in No. 150 or No. 180 is used dry on the second operation and then buffed with a greaseless compound containing a finer abrasive.

Brass is a very soft metal and is easily cut on a buff wheel using Tripoli as the cutting agent. This fact misleads many manufacturers and polishers and is the cause for slighting the polishing operations, and attempting to increase production by using No. 120 grain on the grease wheel prior to buffing. This is false economy. While it is possible to remove No. 120 scratches and roughing scratches from brass with a buff, the costs in buff and Tripoli make this practice almost prohibitive when compared with a well polished casting containing nothing coarser than No. 150 or No. 180 grit size scratches. Brass should be buffed on a good, closely stitched buff wheel using Tripoli as the cutting down agent. It should then be colored on a soft buff using a silicate compound as the coloring agent. The coloring operation should be done before the grease from the cutting down operation has had time to harden. A small amount of whiting sprinkled over the parts before the coloring operation enables the buffer to handle the piece without leaving finger marks on it.

[1] Acknowledgement is made to R. L. Schwaegerle, E. F. Gleason, E. F. Brown and W. C. Breiting, four demonstrators of the Norton Company, Worcester, Mass., for the data from which this article was written.

Los Angeles Branch Annual Meeting and Banquet

By E. LAMOUREUX

The second annual educational session and banquet of the Los Angeles Branch of the American Electroplaters' Society displayed the remarkable growth and the extreme enthusiasm and energy of this Branch, which has been in existence only about two years. Since its organization it has had two annual sessions, regular meetings throughout the year, formed a chemistry class and enlisted nearly one hundred members. Its progress has equalled that of some of the much older eastern Branches, despite the spirited rivalry in the East, where Branches are close enough together to make this a factor in keeping the members interested and active.

The basis of the Los Angeles Branch's growth is, of course, the fact that there are some 250 concerns on the Pacific Coast where plating, polishing and other forms of metal finishing is done.

It is thus not so surprising that the annual meeting of the Los Angeles Branch on March 14 brought out a very large attendance, a fine program of technical papers, and an excellent display of electroplated finishes. The exhibits, as a matter of fact, were of prize-winning quality, in this writer's opinion. Having attended nearly every national convention of the A. E. S., and has seen few exhibits at these conventions which surpassed most of the 27 platers' exhibits at Los Angeles this year. The exhibits were given away as door prizes and the winners were very pleased indeed. The display of exhibits were finished by members of the Branch, and donated by their firms, as follows:

S. and M. Lamp Company
Coast Enameling and Plating Company
Dazey Manufacturing Company
Electroplating Shop
Harvey Machine Company
L. A. Rubber Stamp Company
Merigold Plating Company
National Brass Works, Inc.
Price Pfister Brass Manufacturing Company
Repcal Brass Company
Russill Plating Works
U. S. Bumper Company
Western Enameling Works
Laguna Beach Novelty Company
Angelus Plating Works

There were a number of exhibits of platers' supplies and equipment which were donated by various manufacturers then distributed as prizes, as follows:

Donor	Winner
Russill Plating Works	J. McCandless
Hussander and Martin	R. R. Wilde
National Chemical Company	H. Marmer
L. H. Butcher	R. G. Herbst
C. Koucour	E. Dewey
Oakite Products Company	M. D. Rynkofs
Braun Chemical Corporation	E. A. Savery
Pacific Gas Radiator Company	C. H. Gaylord
U. S. Spring Bumper Company	Mrs. E. A. Savery
S. and M. Lamp Company	Los Angeles Branch
National Chemical Company	R. R. Wilde
Edison Electric Company	Los Angeles Branch
Price Pfister Company	Los Angeles Branch
Turco Products Company	D. M. Bedwell
Turco Products Company	M. McBennett
Universal Chemical Company	C. A. Russill
Public Service Brass	H. Marmer
Dazey Manufacturing Company (Seven prizes)	H. Marmer H. B. Bailey E. P. Robinson J. A. Pifer F. E. Shaw
American Die Casting Company	Los Angeles Branch
Maas Waldstein Corporation	Card Game
Coast Heater Company	M. D. Rynkofs
M. D. Rynkofs	A. Regmunt
Chas. F. L'Hommedieu and Company	N. J. French
National Brass Company	Card Game
Mefford Chemical Company	A. Leimer
L. A. Rubber Stamp Company	Card Game
L. A. Chemical	B. Foss
Harvey Machine Company	Los Angeles Branch

The banquet, dance and card party in the evening was a brilliant affair, very well attended.

Abstracts of Electrochemical Society Papers

TARNISHING OF CHROMIUM-PLATED BRASS

By W. M. PHILLIPS

In the St. Louis district chromium-plated articles appear to have tarnished. Investigation shows that where no nickel or insufficient nickel is first plated over brass or copper articles, this type of failure can occur.

THE PREPARATION OF PURE ELECTROLYTIC NICKEL

Part III. Chemical and Physical Properties

By COLIN G. FINK AND F. A. ROHRMAN

1. A discussion of the theory and applicability of spectrographic analysis is given.

2. The purified nickel was examined for all known, possible impurities spectrographically. Only traces of copper remained as impurities.

3. The existence of boron and sodium in electrolytic nickel was pointed out.

4. The temperature coefficient of electrical resistivity for the purified nickel was found to be .0064.

5. The melting point for the purified nickel was placed at 1,458°C. within the accuracy of the method used.

DEVELOPMENTS IN LOW pH NICKEL DEPOSITION

By W. M. PHILLIPS

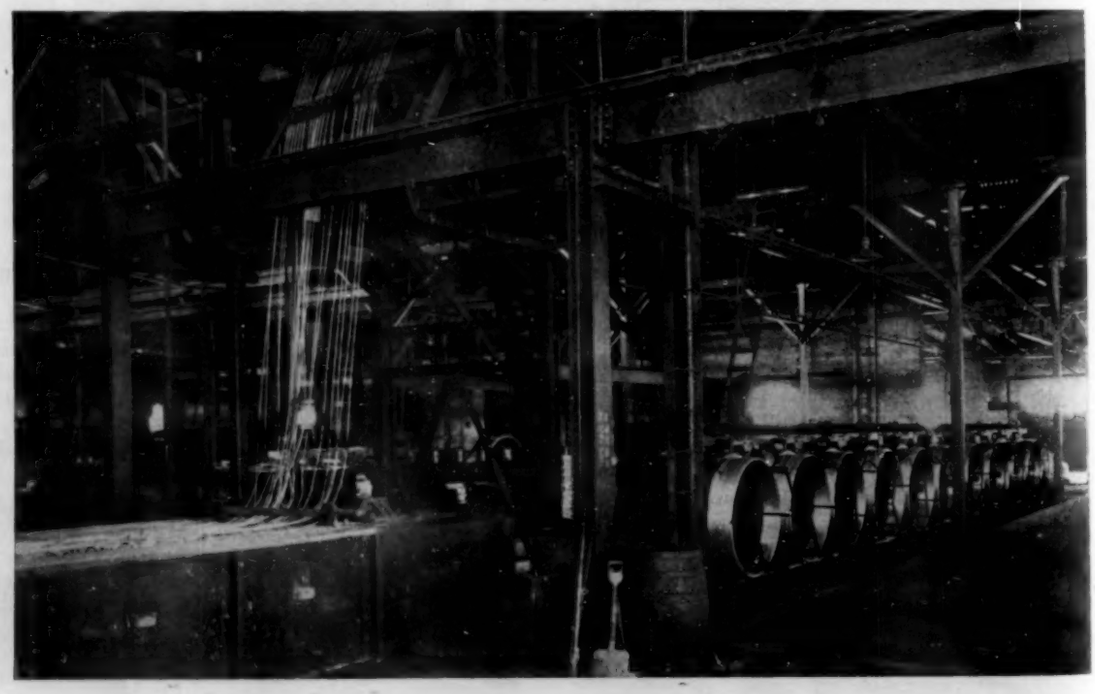
Further commercial work with low pH nickel baths indicates the following: (1) Deposits from low pH baths furnish better protection than those from high pH baths. (2) The hardness of deposits is not directly influenced by the pH. Nickel is softer from baths operated at elevated temperatures. (3) Pitting is no worse with low pH than it is with high pH baths.

Zinc Coating Protects Hudson River Bridge Cables

HOT ZINCING (galvanizing) protects the giant cables from which will be suspended the latest Hudson River Bridge, now under construction between upper Manhattan, New York City, and Fort Lee, N. J. The wires from which the four great cables were fabricated were all twice coated with zinc at the plant of John A. Roebling's Sons of Trenton, N. J., before being spooled and shipped to the bridge site for use in spinning the cables. This wire is slightly less than a fifth of an inch in diameter (0.192 in.). Special machinery is used for double galvanizing and reeling it into coils of about 4,000 feet. The Roebling company used 29,000 tons of such wire to spin the four cables. The spools of wire were taken up on the New Jersey and New York anchorages of the bridge and placed into the special "spinning" machinery there. The wire was then stretched back and forth from one side of the river to the other, and 434 such lengths went to make "strand," and 61 of these strands make up one large cable. Thus there are 26,474 galvanized steel wires in each of the four cables. When compacted and wrapped, each of the big cables will be 36 inches in diameter.

A remarkable fact is that each cable is made of a single small wire which has been carried back and forth across the river the thousands of times needed to build it up. This is because as a reel of wire was used up, the free end of the next was firmly attached to the tail end of the previous coil by means of a special tubular joint which was applied by extreme pressure to make practically one continuous wire. The joint is said to be considerably stronger than the wire itself. When the 61 strands were completed for each cable, special compacting machinery—hydraulic presses which encircled the then many-sided exterior of the big mass of wire at intervals along its length—was applied to compress the cables into cylindrical shape. The press used was, roughly, a steel ring with twelve heavy steel jacks, or plungers, on the inside. The ring was locked around the mass of wire and hydraulic pressure applied to the jacks, each of which was capable of exerting a pressure of 30 tons on the cable.

Architect's Drawing, Hudson River Bridge, Manhattan to Fort Lee, N. J.



Galvanizing and Coiling Cable Wire at the Roebling Plant. Galvanizing Bath on Extreme Left. Vertical Run Allows Hot Zinc Coating to Cool Before Coiling.

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

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Contents

From Clocks to Brass Sheet, Rod and Wire. 191
The Story of the Bristol Brass Corporation—Its Fifteen-Fold Growth in 80 Years and the Development of Its Products.

Metals for Thermocouples..... 193
By H. M. ST. JOHN

Annual Foundrymen's Convention 194
Thirty-Fifth Annual Convention and Exhibit American Foundrymen's Association Held in Chicago, Ill., May 4-7, 1931.

Chromium as a Printing Surface..... 195
By GEORGE B. DRACH and LOUIS WEISBERG

A New Silicon-Zinc Copper Alloy..... 196
The Use of Silicon as a Deoxidizer and Alloying Agent—Preparation of Alloys—Determination of Solid Solubility Limits—Mechanical and Physical Properties—Part 3, conclusion.
By Dr. E. VADERS

Refining Zinc 198
By W. J. REARDON

Mirrors by Deposition of Metal on Glass... 198

How to Spin a Copper Tea Urn..... 199
By WILLIAM MASON

Zinc Coatings for Structural Steel..... 200

Manufacturing Brass Rod..... 200
By W. J. PETTIS

The Electrochemists at Birmingham..... 201
Experts from Europe and Japan at Annual Convention Discuss Silver That Does Not Tarnish, New Vacuum Tubes, Chromium-Plated Aluminum Ware, Acid-Proof Tungsten Plate.

Gold Solutions 204
A Detailed Description of the Three Different Solutions for Electrodepositing Gold.
By OLIVER J. SIZELOVE

Analyzing Chromium Solutions..... 206
A Method for the Complete Analysis of Chromium Plating Solution Including Metals Other than Chromium.
By I. L. NEWELL and W. H. KEEFE

Electroplaters at Newark in Annual Session. 207
Educational Program Brings Out Good Attendance—Honorary Membership Presented to Dr E. B. Weston.

The Polishing of Aluminum and Brass.... 208
The Details of Producing a Bright Finish on Different Alloys.

Los Angeles Branch Annual Meeting and Banquet 209
By E. LAMOUREUX

Zinc Coating Protects Hudson River Bridge Cables 210

Editorials 212
Aids to Lower Costs
Duties of the Metallurgist
Alloys for High Temperatures
A Place in the Sun for Lead
Uses for Silver
Electroplaters to Meet in Rochester

Correspondence and Discussion 214

Technical Papers 214

Shop Problems 215

Patents 217

Equipment 218
Dry Air for Spraying
Burnishing Barrel
Brick Chimney Construction
New Low-Heat Continuous Dryer
Ledoux and Company Move After 50 Years
Drip-Proof Unit Type Motor
New Ideal Motor
Consulting Service on Plating
Automatic Tubing Straightener and Cutter
Universal Automatic Polisher
Sheet Cleaning and Oiling Machine
Fume Recovery from Electric Furnaces
Spray Finishers' School
New Metal-Lined Tubing
New Paint Spraying Equipment
New Foundry Squeezer
Automatic Metallographic Polisher
Factories Testing Laboratory

Associations and Societies 223

Personals 224

Obituaries 225

News of the Industry 226

Review of the Wrought Metal Business.... 231

Metal Market Review 231

Metal Prices 232

Supply Prices 234

THE METAL INDUSTRY is regularly indexed in the "Engineering Index" and the "Industrial Arts Index"

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Editorial

Aids to Lower Costs

IN times like these no less than in good times it is worth while to devote thought not only to increasing sales but to reducing costs. "Reducing costs" is a hackneyed phrase, but it often means life or death to an industry. We are all familiar with the application of automatic machinery and the elimination of hand labor wherever possible, but these are again general phrases. Through what individual avenues, however many in number they may be, can such results be effected? Through the installation of large machinery? What other ways are there?

They seem to be many in number. For example, the stock room may be one place to save money by simplifying stock keeping and by using floor trucks and overhead carriers instead of shelves. Mechanical transportation is one of the best cost reducers. The conservation of floor space through the proper placement or rearrangement of equipment will free areas which can be used for other purposes or released. The rapid reduction of inventories and goods in process to the limit of operating efficiency will release funds making them liquid instead of semi-frozen. The elimination of as much hand labor as possible cuts down not only the direct labor cost but also a surprising amount of supervisory help needed to keep track of those men whose work can be done mechanically.

There are some less concrete, but at the same time productive, forces through which costs may be cut. Locating equipment and placing the men to eliminate unnecessary fatigue by saving footsteps and by allowing them to work in comfortable positions is a far from unimportant factor. Automatic pace-making, not led by a man but rather by the speed at which the machinery is set, within the limits allowable to prevent fatigue, is perhaps one of the most productive methods as it makes output certain at a good level and at the same time reduces, to a great extent, the number of time-keepers and cost clerks necessary to check operations.

To list all the ways of keeping costs down would be impossible in any space no matter how extended. Perhaps the cases cited above are known to most of those who will read them. Yet a concientious check-up on each one and a thorough examination of plant practices in relation to these ideas will in many cases reveal surprising omissions, often unintentional, but nevertheless omissions.

We are in the midst of a period of low prices brought about by the severest competition we have known for many years. We are agreed that it is to the general interest of the people as a whole and to business interests to keep purchasing power high by avoiding reductions in wages. There is only one other possibility, then, of operating profitably, and that is to cut costs.

Duties of the Metallurgist

THERE was a time when the average manufacturing plant either did not know what a metallurgist was or laughed at the idea of employing one. Gradually, the metal companies were converted to the belief that a metallurgist would help them to produce better materials. Now there is no question at all of the indispensability of the metallurgist in the foundry or rolling mill and even in the large manufacturing plant. Not only does he make himself useful in keeping a check on the raw materials, calculating charges and controlling alloy analyses, but in the larger organizations he is employed in many cases, solely for the purpose of developing new products—in a word, research.

In a talk recently given before the Detroit Foundrymen's Association, H. M. St. John, Associate Editor of THE METAL INDUSTRY, listed the duties of a metallurgist or a metallurgical department in connection with a foundry, as follows:

Examination and testing of metals.

Calculation of charges and control of the alloy analysis.

Supervision of quality of molten metals as delivered from furnaces and investigation of metal troubles.

Examination and classification of rough casting scrap and machine shop scrap, when the latter is available.

Technical control over the melting process.

Technical control over maintenance of furnace refractories.

Technical control over sand reclamation, conditioning and blending.

Investigation of new foundry methods and improvements.

Supervision over methods of temperature control in the foundry.

To be sure it is a good metallurgist who can perform all of these functions perfectly. The real point, however, is as given by Mr. St. John, that the value of a metallurgist to a foundry does not depend on his ability to give infallible answers to questions of this character. If he is a good metallurgist, he is capable of observing accurately the symptoms of foundry troubles and tracing them to their sources. He may not be sure of the exact cause, but if he finds the source, the difficulty can usually be corrected.

Alloys for High Temperatures

ALLOYS are faced with a new demand—the increased power to resist high temperatures. Engineering requirements have risen due to the rapid developments in internal combustion engines for automobiles and flying. Power plants are asking for better and stronger materials. The oil, chemical and ceramic industries are demanding higher grades of alloys with greater resistance to attack by heat and corrosion, and longer life.

The coming meeting of the American Society for Test-

ing Materials, at Chicago, in June will include joint sessions with the American Society for Mechanical Engineers on the effect of temperature on the properties of metals. These sessions will be divided into two parts—one on the engineering needs for and trends in the industries using alloys at high temperatures, and the other on the properties of the alloys available for such uses. Discussions will be held on the alloy requirements and performances in core ovens, tempering ovens, melting pots for various uses, heat treating and forging furnaces, annealing and carburizing boxes and open hearth furnaces. There will also be questions about the alloys used in non-ferrous roasting, smelting and refining. The requirements of power plants, chemical manufacturers and oil refineries will be presented, and of course also the automotive and flying industries.

Metallurgists will describe the properties of various alloys used at elevated temperatures, including not only the special heat-resisting alloys but also the more common engineering materials of construction such as aluminum, zinc and copper alloys, bearing metals and nickel and chromium mixtures.

Metals have been used for a long time under high temperatures but with only a partial degree of satisfaction. The needs and demands of engineering are becoming daily more stringent. The best results will be obtained by the cooperative action of the mechanical engineer and the metallurgist in asking for and giving the best possible alloys to suit the dozens of different conditions under which they must work. Sessions of the type to be held by the Testing Materials Society and the Mechanical Engineers are the best imaginable aid to such progress.

A Place in the Sun for Lead

LEAD is beginning to come out of its Cinderella's corner and to assume the credit which it deserves. It has always been looked upon as a useful poor relation. It is cheap and has its place, but it is weak, soft, very heavy and has always been considered unattractive. Of course, very definite and worth-while use was made of its so-called bad properties. It has been an indispensable constituent of other bearing metals. Its low melting point has made it important in solders and its weight has been used as a stabilizer. It has at the same time been credited with some excellent qualities such as resistance to sulphuric acid, especially when alloyed with antimony, and resistance to underground corrosion. Its softness has made it easy to work and cheap to fabricate.

Probably the most important factor in the use of metallic lead in the past 20 years has been the automotive industry which has demanded storage batteries in which lead is an indispensable part. But there are many demands made for lead, each in smaller volume, and because they are numerous, use up considerable tonnages. Cable sheathing, for example, is one of them; caskets another.

A recent step forward for lead is its introduction in the building industry for decorative and ornamental purposes, and for garden statuary. It has mechanical advantages and its color can be used to harmonize with certain types of masonry.

In the industrial world, lead has a place which nothing as yet seems to be able to take, in solders, bearings, cable covering and more recently, for mattresses in building foundations. In plumbing its use is age old. As a constituent of paint it is standard the world over. It will be interesting to see along what lines it will expand in the next few years.

Uses for Silver

SILVER is attracting attention these days in two ways. One is its very low price, which is, of course, nothing to be proud of. The other way, a little more hopeful, is consideration of the possible uses and outlets in industry because of its present comparatively low cost.

Silver has a number of very valuable properties. It is soft and easy to work. It alloys easily, for hardening purposes, with a number of other metals. It has the highest known thermal and electric conductivity. It is resistant to hydrochloric acid, chlorides, caustic alkalies, ammonia and sulphuric acid (at low temperatures). It can also be used in connection with organic acids. It is best known in alloy form as Sterling silver, (925/1000 pure) and in silver solders, which contain copper and zinc. The solders have a wide range of composition varying from 10 to 80 per cent silver, containing copper and zinc, and in some cases tin, nickel or manganese.

Fine silver is available in all commercial forms such as sheet, foil, tube, wire, etc. Silver and its alloys can be cast, rolled, drawn, welded and soldered, but the technique is often delicate and can be applied only by trained and experienced workers. At this time the most important use of silver in industry is in connection with the manufacture of organic chemicals. The food products industry is, however, looked upon as a possible field. Fine silver sheets can be rolled onto copper and other base metals to provide the necessarily resistant surface required, at the same time reducing the cost of the equipment by using a base metal for the bulk of the weight.

At the present time there is no sign that anything is likely to replace silver, as Sterling or plate, in its major general use—silverware. It is more than certain, however, that these markets are not enough to absorb the world's output of silver, in addition to the demonetized coinage metal which is being dumped on the market.

There are many legitimate places for silver in industry which patient research could disclose. That is the path for the industry to follow to get back on its feet.

Electroplaters to Meet in Rochester

THIS is the first call to our readers to remind them that the American Electroplaters' Society will hold its annual convention in Rochester, June 29-July 2, 1931. It is time now to make plans to attend. It is time also to go to heads of departments and employers to make arrangements so that electroplating foremen, chemists, and metallurgists interested in plating may be released during that week.

We must add, however, that it is worth while for the company to attach even more importance to this convention. Not only should the men be allowed to attend; they should be sent at the expense of the company and required to turn in reports on the papers, discussions and exhibits. In this way all concerned will benefit to the utmost.

Details of the convention will be announced in our columns at a later date, but the reservation of convention week for the sole purpose of attending these meetings, should be attended to without delay.

Correspondence and Discussion

Prize Awards

To the Editor of THE METAL INDUSTRY:

We have received the April issue of THE METAL INDUSTRY containing the announcement that our article on "Variations in Thickness of Nickel Deposits" has been awarded one of the prizes for 1930. We assure you that the announcement came as a very pleasant surprise. And, in view of the fact that this is the first time the prize has been given, we feel especially honored by having our paper selected. We thank the judges and we also thank THE METAL INDUSTRY for making the award available. We believe that its action in establishing this annual prize will stimulate and encourage the publication of papers pertaining to electroplating. THE METAL INDUSTRY will thereby be contributing materially to the advancement of the art.

LELAND E. GRANT.
VERNON E. GRANT.

Milwaukee, Wis.,
April, 1931.

A Finishing Engineers' Society

To the Editor of THE METAL INDUSTRY:

Having been away from Chicago for the past four months, I have been out of touch with THE METAL INDUSTRY, and I have just read the article by Mr. A. P. Munning in the January, 1931, issue; also the commenting article by Mr. J. H. Hansjosten in the February issue.

The suggestion by Mr. Munning relative to a Finishing Engineers' Society deserves consideration. However, most of the plating foremen are polishers, or at least have a knowledge of the subject, and they are well informed on finishing in other respects. Hence, if the suggestion is brought into existence, it may be found that we would have two societies of relatively the same membership. Of course, there are advantages and benefits to be gained particularly if the polisher foreman who does not know anything about plating can be brought into a society and educated in what his work really is, because it is certain that there are very few men today who are well informed on the subject of polishing in all of its ramifications. I sometimes doubt if there are any left who really know what a good job of polishing ought to be.

Mr. Hansjosten cites an address by Robert T. Kent to the effect that polishing is now where grinding was thirty years ago, and adds that this party stated a "fact." In my opinion, polishing thirty years ago was infinitely better than any sample of such work today. In fact, if we were to take the subject from the present time and go back forty years, the further we went back, the better polishing we would find; and, starting from that point and coming down the years, the worse it becomes, until today really good polishing has become a "lost art."

I want to revise the quotation attributed to Mr. Kent in this wise: "The best job of polishing today in 95 per cent of the cases would have been considered only a fair job thirty years ago."

This criticism may sound harsh, but I am sure that it is true.

E. LAMOUREUX.

Chicago, Ill., April, 1931.

"Just What We Are Looking For"

To the Editor of THE METAL INDUSTRY:

We acknowledge with thanks your information on etching tin. It is just what we are looking for.

BEVERLEY MANUFACTURING COMPANY, INC.,
W. J. Keane, Treasurer.

Technical Papers

Use of Aluminum Alloys in Commercial Motor Vehicles, by Frank D. Goll. Aluminum Company of America, New Kensington, Pa. A paper presented at the Transportation Meeting of the Society, October 22-24, 1930.

The trend in the commercial transportation equipment is toward the light, strong alloys of aluminum. These alloys, known as 17S, 25S and 51S, of the following compositions:

	Copper	Manganese	Magnesium	Silicon
17S	4.0	0.5	0.5	..
25S	4.5	0.8	..	0.8
51S	..	..	0.6	1.0

The author describes the heat treatment of these alloys, the selection of the correct alloy for various parts of motor vehicle bodies and describes generally the properties of these alloys, methods of gravitation, and assembly into automotive equipment.

Enamels for Sheet Steel. University of Illinois, Urbana, Ill. Bulletin No. 214 of the Engineering Experiment Station. Price, 20 cents. Full title: The Effect of Furnace Gases on the Quality of Enamels for Sheet Steel, by Andrew I. Andrews and Emanuel A. Hertzell. Report of an investigation conducted by the experiment station, in cooperation with the Utilities Research Commission.

Inspection of Materials. National Engineering Inspection Association, P. O. Box 1115, Pittsburgh, Pa. Tentative methods of procedure for inspection of materials.

American Standards Year Book—1931. American Standards Association, 29 West 39th Street, New York City. A 102-page book explaining the Association and giving indexes of adopted standards, projects under way, and a large amount of other data valuable to anyone interested in standards and standardization.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, applications should be made to the governmental body responsible for the publication.

Freezing Point of Nickel as a Fixed Point on the International Temperature Scale, by H. T. Wensel and W. F. Roeser. Bureau of Standards Research Paper 258. 5 cents.

Properties of Pure Nickel, by Louis Jordan and William H. Swanger. Bureau of Standards Research Paper 257. 10 cents.

Platinum, by Paul M. Tyler and R. M. Santmyers. Bureau of Mines Information Circular 6389. A very complete report on all phases of the subject. Apply to Bureau.

Lead in 1929 (General Report), by Elmer W. Person. Bureau of Mines, Department of Commerce, Washington, D. C. (Published March 7, 1931.) 10 cents.

Zinc Coated Iron or Steel Culverts. Federal Specifications Board, Washington, D. C. Proposed Federal specification; available free on request to the Board.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Brown on Aluminum

Q.—I have to color some large aluminum castings brown. Please let me know if there is any dip or plating solution which will do this work.

A.—There is no dip or plating method of producing a brown finish on aluminum as far as we know. If you can use a lacquer enamel finish the color may be readily produced.

The Metals Protection Corporation, Indianapolis, Ind., license a process whereby different colors are produced upon aluminum. We would suggest that you get in touch with them. Their method will prove satisfactory for your purposes.

O. J. S., Problem 4,085.

Cadmium and Copper Plating

Q.—We are plating steel radiator shells, etc., with cadmium, which we later nickel plate. The cadmium is given ½ hour plate and then buffed, after which it is nickel plated.

Does cadmium have a tendency to turn yellow after being out in the weather for some time? Is cadmium a better base for nickel than copper? We would appreciate any information you can give us on the subject.

We are also trying to operate a copper solution both as a still tank and for barrel work. Our barrel work is satisfactory, but used as a still tank the work has a very poor color and we have difficulty in plating nickel over it. Should a separate tank be used for each kind of work? We are using your formula as is given in the "Platers' Guidebook," but with the double strength that would be required for barrel work.

A.—Cadmium plating previous to nickel plating has not come into general use for two reasons. One is the greater cost and the other the fact that if the deposit of nickel is broken there is a tendency for the cadmium deposit to corrode and cause peeling of the nickel deposit. In the salt spray or atmospheric exposure tests the nickel accelerates the corrosion of the cadmium, making a deposit of cadmium and nickel less resistant to corrosion than a deposit of copper and nickel.

As a rule, barrel copper solutions are operated with higher metal and free cyanide contents than still solutions, and it is not advisable to use a barrel solution for a still solution. Different current densities are used and this has a direct effect upon the composition of the solution and the results obtained.

O. J. S., Problem 4,086.

Chromium

Q.—I would like a formula for chromium plating nickel plated steel parts. We would like to use this solution cold. It is really intended for a flash. Any information you can give me will be greatly appreciated.

What plater's handbook would you recommend which is practical on chromium plating?

A.—The temperature at which a chromium solution is operated is one of the factors which control the character of the deposit. We know of no formula for a chromium solution that can be used cold that will produce uniform results.

The following formula of a solution operated at 95° F., with a cathode current density of 50 to 75 amperes per square foot, will give good results:

Chromic acid	55 oz.
Sulfuric acid	.00.3 oz. by weight
Water	1 gallon

We are sending you a copy of the "Platers' Guidebook," which we publish and distribute gratis. It should prove useful to you.

O. J. S., Problem 4,087.

Chromium Analysis

Q.—Please analyze sample of chromium plating solution we are sending you, and advise as to its correction, etc.

A.—Analysis of chromium solution:

Chromic acid	25.75 oz.
Trivalent chromium	2.66 oz.
Sulphates	1.60 oz.

This solution is in a very poor condition. The chromic acid content is too low and the trivalent chromium and the sulphate contents are very high. We would suggest that this solution be discarded and a new one made. Use the following formula:

Chromic acid	55 oz.
Sulfuric acid	0.3 oz. by weight
Water	1 gallon

Operate solution at a temperature of 95° F. Use a cathode current density of 50 to 75 amperes per square foot. Use 6% antimony lead anodes.

O. J. S., Problem 4,088.

Cleaning Castings

Q.—We would appreciate any information you can give us on the equipment necessary for an acid dip or other method of cleaning brass castings (after rumbling). Castings are such as steam valve bodies, water fittings, etc. The plant should be capable of handling one ton of castings per day. (We operate in Buenos Aires, Argentina.)

A.—Equipment necessary to handle approximately one ton of brass valves and fittings is a water tumbling barrel lined with wood. This can be had from any good foundry supply house.

All the sand is knocked out of the castings and the castings are then placed in the rumbler with a lot of fine slag so the castings will not be nicked in the tumbling. When cleaned of all the sand they are taken to the dipping room.

Here you should have a wood tank about six feet long that will hold water, and two crocks or other vessels that will hold acid. Place these vessels in the water tank. Get another tank or half barrel in which you can insert a steam pipe to keep water hot.

In one of the partly submerged vessels place 38% yellow aqua fortis. In the other place 60% commercial sulphuric acid. String the castings on copper wire and dip first in the aqua fortis then

in cold running water. Then dip in the sulphuric acid and rinse in cold water. Then dip in the hot water. Then swing the work a few times to dry the work is completed.

Another method is to make one acid dip composed of yellow aqua fortis 38%, 2 gallons; commercial sulphuric acid 60%, 1 gallon; water, ½ gallon; common salt, 1 ounce.

Let this cool before using. Best results are obtained by mixing the acids the night before. This method is used by some of the manufacturers in this line of work, and the color obtained is very uniform. W. J. R., Problem 4,089.

Etching Aluminum

Q.—Will you kindly give me information on the following items; What is the best solution to use for etching aluminum nameplates?

How can I produce the black as on sample inclosed?

What is necessary to put a black nickel on the aluminum after it is etched?

I am working on a job on which the lettering has to be etched very high. After the lettering starts to raise the resister starts to lift. I am using a very weak hydrochloric solution with some aluminum chloride. I dust the plates with asphaltum and back them.

A.—We are assuming, as the sample submitted indicates, that you are using the photographic process for preparing the plates for etching. For this purpose a good solution to use is a 5% solution of hydrochloric acid with a four- to five-ounce addition of perchloride of iron.

The black finish on sample sent in can be produced as follows: Follow your usual procedure in etching the sheet aluminum. After etching and drying, coat the entire sheet by spraying with a dull black baking japan. Bake 45 minutes at 400° F. Relieve the highlights using No. 380 sandpaper moistened with benzine. A sample panel showing the black finish, cost of material, etc., is being sent to you. The labor cost should not exceed ten cents per 100 nameplates.

After the nameplates have been etched, flash in a cold solution of cyanide copper, rinse, and transfer to a nickel solution composed of:

Single sulphate of nickel	12 oz.
Sodium sulphate	25 oz.
Nickel chloride	2 oz.
Boric acid	3 oz.
Water	1 gal.

or, plate directly in this nickel solution. As soon as the plates are fully covered, transfer to a black nickel solution made up as follows:

Single sulphate of nickel	8 oz.
Sulphocyanide of sodium	2 oz.
Sulphate of zinc	2 oz.
Chloride of nickel	2 oz.
Water	1 gal.

Use nickel anodes; voltage ½ to 1. If the color is not sufficiently black add ½ ounce of sulphate of zinc per gallon or reduce the voltage. Remove the resist from raised portions and lacquer to hold the black color of the background.

Where a deep etching is required the current density should be reduced to keep down the evolution of gas or the work should be agitated to remove the gas as it is generated.

W. F., Problem 4,090.

No Chromium Dip

Q.—I would like some information about a black dip for chromium plating directly on die castings without any other deposit. My employer has asked me if I can tell him what such a solution would be. If you can tell us what this is, it will certainly be of great service.

If you have some good book on plating, please let me know the title. I have charge of a shop, but am still young at the game, having been studying it for only nine years.

A.—There is no dip method of depositing chromium upon die cast or any other metal that we know of. Nor is it advisable to deposit chromium directly upon a die cast base metal. It is best to nickel plate and then chromium plate.

For a good book on plating, we recommend "Principles of Electroplating and Electroforming," by Blum and Hogaboom, obtainable from this journal. Also write to the Superintendent of Documents, Washington, D. C., for a copy of Technologic Paper No. 346, which contains valuable information on chromium plating. The price of this paper is 15 cents, which should be sent with the request for the paper. O. J. S., Problem 4,091.

Nickel Analysis

Q.—We are sending you a sample of nickel solution for analysis. Will you please put it through a severe test as we are having trouble from time to time on cast brass (red)?

A.—Analysis of nickel solution:

Metallic nickel	2.24 oz.
Chlorides	2.94 oz.
pH	5.2

The metal and chloride contents are good. The pH is too low. Add to each 100 gallons of solution 12 fluid ounces of 26° ammonia. Stir solution thoroughly after adding the ammonia.

With some alloys of cast brass greater adhesion of the nickel deposit is had if the castings are plated for a few seconds in a warm cyanide copper solution before nickel plating.

O. J. S., Problem 4,092.

Peroxide in Plating

Q.—Will you please give us information as to the use of peroxide hydrogen in the plating industry?

A.—Hydrogen peroxide is being used in general throughout the plating industry in nickel plating solutions to prevent the deposition of hydrogen gas with the deposited nickel, which causes porous or pitted deposits.

In the past, hydrogen peroxide of 25 volume was used, but lately the 100 volume seems to have gained preference. While the initial cost of the 100 volume peroxide is considerably greater, the stronger material lasts longer, especially when hot nickel solutions are used. O. J. S., Problem 4,093.

Silver Analysis

Q.—Please analyze the sample of silver solution we are sending under separate cover.

A.—Analysis of silver solution:

Metallic silver	5.32 oz.
Free cyanide	1.81 oz.

The metal content is quite high and the free cyanide content entirely too low. Add 4 ounces of sodium cyanide to each gallon of solution. O. J. S., Problem 4,094.

Spelter to Fuse at 725° F.

Q.—We are jobbers and distributors of metal products and one of our customers requires a brass spelter that will fuse at about 725 degrees Fahrenheit. We would appreciate your advising us if you know of any such spelter and where it may be obtained.

A.—The melting point of spelter or zinc is 785 degrees Fahrenheit, and if your customer requires 725 degrees Fahrenheit it will be necessary to add another alloy. Tin added to zinc will reduce the melting point. 7% tin and 93% zinc will fuse at about 725 degrees Fahrenheit.

A mixture of 89% zinc, 3½% copper, 2% tin, ½% aluminum used for die casting has a melting point of approximately 725 degrees Fahrenheit. There is no grade of zinc that we know of having less than 785 degrees Fahrenheit fusing point, which for all practical purposes should be near enough for your customer.

W. J. R., Problem 4,095.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,793,156. February 17, 1931. **Metal Cement.** William R. Chapin, Indianapolis, Ind.

A cementing compound consisting of approximately 65% silico manganese, between 1% and 10% powdered borax glass, and the remainder fine steel filings, substantially as set forth.

1,793,157. February 17, 1931. **Metal Cement.** William R. Chapin, Indianapolis, Ind.

A cementing compound consisting of approximately 40% silico manganese, approximately 25% powdered copper between 1% and 10% powdered borax glass, and the remainder fine steel filings, substantially as set forth.

1,793,551. February 24, 1931. **Electroplating Machine.** Christian H. Jording, Columbus, Ohio, assignor to The John W. Brown Mfg. Company, Columbus, Ohio.

In electroplating apparatus, a frame, an endless carrier mounted for travel in connection with guides carried by said frame, longitudinally spaced brackets secured to said carrier provided with lateral offset portions, electric conductors positioned below the lower run of said carrier and arranged for engagement with the under surface of the lateral offset portions of said brackets.

1,793,914. February 24, 1931. **Apparatus for Treating Flexible Metal Bodies.** Frank M. Dorsey, South Euclid, Ohio, assignor to Madsenell Corporation, Portsmouth, Ohio.

Apparatus for treating a flexible elongated metal body, which comprises a container, means associated with said container for successively flexing said body in different directions at predetermined surface portions of the same more fully to expose impurities present in said body at said surface portions and means for turning said body about an axis at an angle to the axes of flexing of said body.

1,793,936. February 24, 1931. **Method of Fabricating Metal-coated Articles.** Frank V. Knauss, Portsmouth, Ohio, assignor to Madsenell Corporation, Long Island City, N. Y.

The method which comprises mechanically working a nickel-surfaced object, then treating the same as an anode in a bath of sulphuric acid and thereafter electrodepositing a fresh coating of nickel on the nickel surface so treated.

1,794,093. February 24, 1931. **Apparatus for Coating Metal Sheets.** Edmund W. Shinn and Robert H. Scott, Cumberland, Md.

The combination with a coating machine having squeezing rolls through which coated sheets are advanced, of knives bearing against the rolls, in adjustable support for the knives, and means for positioning said support for varying the position of the knives with respect to the rolls, the knives being of blade-like form, with their edges pointed against the direction of rotation of the rolls.

1,794,487. March 3, 1931. **Process and Apparatus for Electroplating.** Kevie W. Schwartz, New York, N. Y., assignor, by mesne assignments, to United Chromium, Incorporated, New York, N. Y.

Apparatus for plating successive portions of a large area, comprising an anode, means for moving said anode comprising tubular means extending outside of the bath, conductors in said tubular means connected to said anode, and protected from the bath by said tubular means, and means for guiding said anode structure in its movement to its different positions of use.

1,794,627. March 3, 1931. **Method of Making Metal Pattern Equipment.** Arthur K. Laukel, Detroit, Mich.

The process of producing a metal element of pattern equipment which consists in providing a mold having a pattern thereon which is a true counterpart of the molding surfaces of the element to be produced, applying a metal face plate to the mold, said face plate having an opening therein of sufficient size to receive said pattern, and plating the mold exposed through the opening of said face plate to form a continuous electrodeposited shell extending from the edges of the said opening to the margins of said pattern and over the said pattern.

1,794,748. March 3, 1931. **Apparatus for Electrodeposition.** Charles E. Yates, East Rutherford, N. J., assignor to Anaconda Sales Company, New York, N. Y. Apparatus comprising the combination of a moving member arranged to carry an article, means for releasing the article, a table arranged adjacent the path of the member and adapted to support the article in position to be engaged and moved by said member after the article has been released, a movable part on the table upon which the article is moved by the member.

1,795,079-80-81. March 3, 1931. **Method of Electroplating Zinc on Iron or Steel.** Sidney H. Davis and Carl O. Anderson, Baxter Springs, Kans.; William N. Smith, Platteville, Wis.; and Herbert R. Hanley, Rolla, Mo., assignors to The Century Zinc Company, a Corporation of Ohio.

In a method of electroplating zinc on iron or steel, the steps of forming a thin initial coating of zinc on the article to be plated by passing thereto from an insoluble anode through a bath of a solution of zinc sulfate of relatively low acidity a direct current of relatively high current density and then after the formation of said initial coating continuing the formation of the plating by the passage of a current of lower density to the article from an insoluble anode through a bath of higher acidity than the first-mentioned bath.

1,794,973. March 3, 1931. **Continuous Method of Chromium Plating Metallic Wires or Strips.** Byron V. McBride, Irwin, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

A continuous process of electrodepositing a protective layer of chromium upon a metallic wire or ribbon which comprises drawing the wire or ribbon downwardly through a suitable chromium-plating solution in such manner that all portions are substantially equidistant from the anode and exposed directly to the voltaic action of the bath, passing it horizontally through the plating solution, while insulating it almost completely from the voltaic action of the bath, and then drawing it upwardly through the solution in such manner that during the upward travel, all portions are again substantially equidistant from the anode and exposed to the direct voltaic action of the bath.

1,794,929. March 3, 1931. **Method of Fractionally Plating Objects.** Victor L. Soderberg, Detroit, Mich.

The process of treating an object so as to electroplate with chromium only a portion of the surface on which chromium would normally be deposited during a plating operation, which consists in covering with nitro-cellulose lacquer those portions of the object that are to remain unplated, and then placing the object in any usual or suitable bath adapted for chromium plating and completing the plating process in any usual or suitable manner.

1,794,858. March 3, 1931. **Electrodeposited Core Box.** Arthur K. Laukel, Detroit, Mich.

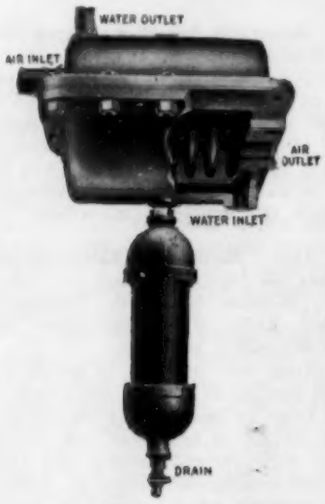
The method of making an element of pattern equipment consisting in preparing a mold having an impression or counter part of such element, applying a face plate to said mold and around said impression, preparing the mold for electrodeposition, depositing a shell of metal on said impression confined within said face plate, fitting to the face plate and deposit a back plate having projections thereon, by trimming said projections to conform with said face plate and deposit, and filling the space between said plates.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Dry Air for Spraying

The Eureka Pneumatic Spray Company, 128 White Street, New York City, announces the development of a new separator for extracting the oil and moisture from the air used for spraying. They claim one hundred per cent efficiency for this new device in the most extreme cases.



Spray Air Separator

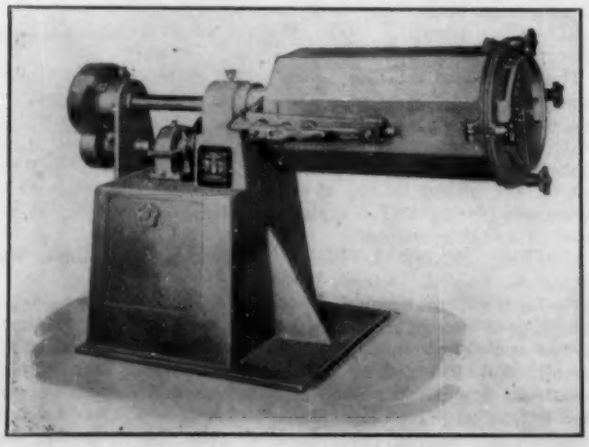
Oil and moisture in the air-line has always been a most troublesome problem in the finishing-room, even causing complete shut-downs in very extreme weather, the company states. The new device is water-jacketed and connected to the water supply. The circulating water chills the baffles in the air-chamber to about twenty degrees below room temperature. Thus, the moisture is condensed out of the air as it passes through the condenser and comes in contact with the chilled baffles.

Refrigeration is the only positive means of condensing the moisture out of the air, and this separator takes advantage of this old principle with a water consumption of about fifteen gallons per hour, according to the Eureka company, who will furnish readers with full details of this new device, which they say is now available for immediate delivery.

Burnishing Barrel

A new addition to the line of finishing equipment manufactured by Chas. F. L'Hommedieu and Sons Company, 4521 Ogden Avenue, Chicago, Ill., is the "Reliance" Type L burnishing barrel. This machine is stated by the maker to be designed to provide efficient operation and long life, having such features as Timken roller bearings, perfectly balanced cylinder, heavy, rigid construction, accessibility of parts, two speeds, protection of motor from dirt. The machine is furnished with either motor or belt drive.

Complete information is available on request to the manufacturer.



New "Reliance" Burnisher

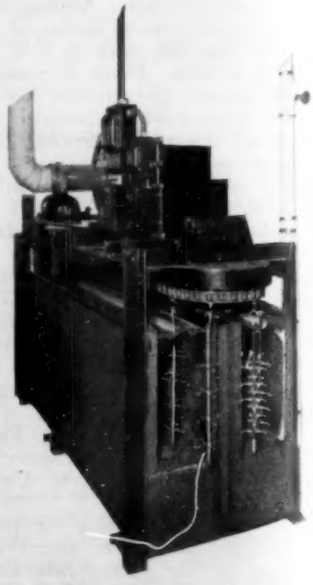
Brick Chimney Construction

Construction of brick chimneys and repairs to chimneys of all sizes is the business of the Northwestern Chimney Construction Company, Leader Building, Cleveland, Ohio. The company states it has designed and constructed chimneys of great height for many important industrial concerns, railroads, etc., including such jobs as four 200-foot chimneys for the Donner-Hanna Coke Corporation, a 175-foot job for the Pennsylvania Railroad, two 160-foot chimneys repaired for American Agricultural Chemical Company, and many others.

A specialty of the company is the construction of perforated radial brick chimneys of large dimensions. Complete information on this type of work may be obtained by readers, who should address the company.

New Low-Heat Continuous Dryer

A low-temperature continuous dryer for articles coming from cold or hot rinse tanks in finishing departments, plating shops, etc., is offered by the Metalwash Machinery Company, Inc., 117-119 East 24th Street, New York City. This is stated to be a relatively small, compact equipment for rapid operation on a variety of sizes of work. No sawdust is employed.



New Dryer Equipment

The work is carried by conveyor through two blast tunnels and returns to the operator. Electric heating elements or steam radiating fin coils are employed. An exhauster produces the blast pressure which forces hot air through nozzles against the passing work, blowing off water globules mechanically, while the heat dies out other moisture. Water spots on highly polished materials may be prevented by turning off heat in first tunnel, permitting air to blow off excess water and partially dry the work before it reaches the heated second tunnel for complete drying by evaporation of remaining moisture.

Advantages claimed for the equipment include generous production capacity; small floor space requirement; prevention of tarnish as compared with other drying methods; work may be handled as soon as it leaves the machine; comfort for operator, there being no steam exhaust or gas fumes; simple repetition without harm to work if operator leaves the machine.

Complete information is available to readers, who should address the manufacturer for it.

Ledoux and Company Move After 50 Years

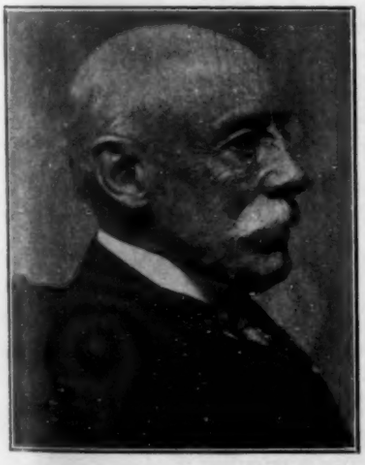
For over fifty years, Ledoux and Company have been conducting their business of weighing, sampling and assaying ores and metals at John and Cliff Streets, and during these years a large part of the copper and other metals produced throughout the world have been sold on their certificates of weight and assay which a slowly built reputation for probity and accuracy have made acceptable everywhere. In earlier days, copper from Australia was refined here; now great mines, then unthought of, in the Belgian Congo are selling their product on the expert appraisal of this same firm. Ledoux and Company's certificates continue to be accepted by buyers at the ends of the earth, but the old building at 99 John Street is going down and the firm located there so long has built a splendidly equipped and conveniently located new laboratory on the top story of a modern building at 155 Sixth Avenue, where light and air are unobstructed and the danger of tall skyscrapers growing up about them (as now in John Street) seems remote. The change suggests words of retrospect and anticipation, for 99 John Street has been known so long to all who were interested in ores and metals.

LOUIS V. LEDOUX
President, Ledoux and Company

ALFRED M. GAW
Secretary and Treasurer

ALBERT M. SMOOT
Vice-President and Technical Director

When Ledoux and Company began business, American producers of high grade ores and their partially refined products were obliged to settle on the landing weights in Swansea, and to accept the results of primitive and inaccurate methods of assay practiced by Cornish assayers. One of the achievements of the Ledoux firm was to demonstrate the reliability of American methods and force payment on results obtained by them before shipment from America. They have acted and continued to act for banks and insurance companies, and as consulting experts in many famous cases in the courts.



ALBERT R. LEDOUX, Founder and First President of Ledoux and Company

Dr. Albert R. Ledoux, the head of the firm from 1880 until his death in 1923, held important positions such as the presidency of the American Institute of Mining Engineers. He was a consulting expert of the Bureau of Mines, and for something like fifteen years was the receiver of that ill-starred mining venture known in its day as Harney Peak. It was he who advised the City of New York in connection with the burying of its electric wires years ago.

Changes have come to all things connected with the metal industry, and Ledoux and Company now, in addition to their older lines of work, are specializing in the representation of shippers of waste materials, white and red alloys. They act, as in the past, as experts for banks and insurance companies, as consultants in many kinds of testing, and in the law courts in cases that are sometimes of extreme importance. Submitted samples come to them from everywhere and of many materials; also, strange problems of all sorts, ranging from inquiries as to where and why losses occur in refineries, to attempts to ascertain by science whether or not supposedly ancient bronzes of fabulous value are authentically old or are modern forgeries. They have their representatives in the West as well as along the Atlantic seaboard, and also a highly trained corps of efficient samplers ready to go where work is to be done, as well as thoroughly expert chemists in their laboratories. There are two agencies in Canada, at Montreal and Copper Cliff. The equipment of the new laboratory at 155 Sixth Avenue is of the most modern variety and has been designed by the technicians of the Ledoux staff to combine speed and accuracy in ways that have been worked out during years of experience in the old place.

Hard, Low-Friction Bearing Bronze

Bushings and bearings made of super-hard, low-friction bronze alloys are announced by The Bunting Brass and Bronze Company, Toledo, Ohio, following extensive research work of the Bunting organization. The new Bunting product is designed to meet the need in mechanical industry for a bearing for applications where hardness and ability to withstand pounding are desired, together with the low-friction and minimum wear of a leaded phosphor bronze alloy. Such bearing requirements are especially a problem in mechanical applications subjected to shock loads, high speeds and other severe operating conditions.

The lead content in the new bearing bronze can be varied from 5 per cent to 25 per cent, depending upon the type of service required. It offers physical properties much superior to the higher friction bronzes containing little or no lead which have heretofore commonly been specified due to their ability to withstand heavy pressure and shock loads, the Bunting company states. The new bearings and bushings are now being supplied to many manufacturers, it is stated.

Drip-Proof Unit Type Motor

The Ideal Electric and Manufacturing Company, Mansfield, Ohio, has added to its line of "Ideal" motors of unit type construction, a motor which is protected from water or other liquids which drip on it or which might splash in through the ends. In many places where it is necessary to wash down the equipment with a water spray daily, the drip-proof motor is said to be the practical answer to a long felt need. Its action, as water is thrown into the motor, is to immediately discharge it through the vent at the bottom of the center enclosing jacket. Air circulation is from both ends towards the center and out through this vent. Large shrouded fans located just inside the end brackets at each end of the motor produce the action which discharges the water. Should water get beyond the shrouded fans, the insulation is so prepared that an occasional wetting will not have any serious effect. The strong blast of air which is continually forced through the motor while in operation immediately evaporates any water that may reach the windings, it is stated.

Water dripping from above cannot enter the motor. The end bearing brackets are so shaped that water dripping on them travels around the end and to the base without entering the motor. The shroud cover encircling the motor at the center effectively prevents the entrance of water at this point.

Consulting Service on Plating

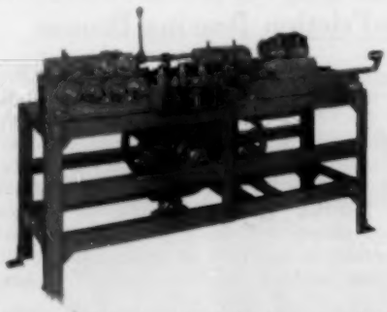
A technical service on electroplating, including complete laboratory control, experimental laboratory work and other scientific procedure for which most platers are not equipped, is offered by Donald Wood, 110 Broad Street, Boston, Mass. Periodic solution analysis as well as general laboratory work can be furnished, as well as instruments and methods for plant operation. Advice on questions of process and method, plant layout and equipment, supervision of installations, etc., are offered. The firm can supply standardized solutions for analytical purposes, as well as indicator solutions.

Another branch of the firm's work is a standards service to buyers and producers of electroplating, with standardized testing methods and specifications.

Automatic Tubing Straightener and Cutter

The need for equipment to speed up the operation of straightening, measuring and cutting tubing led to development of the type "TC" automatic copper tube straightening, measuring and cutting machine by the Artos Engineering Company, Milwaukee, Wisconsin.

The end of a coil of tubing is inserted in the feeding rollers of the machine and the entire operation of feeding, straightening, measuring and cutting is automatic. The feeding speed is about 50 ft. per minute, but the actual production is dependent on the length of pieces to be cut. For example, for 12 inch lengths the production is approximately 22 pieces per minute, and for 24 inch lengths it is about 15 pieces per minute. The machine is easily adjustable for any cutting length up to and including 6 ft. If desired, the machine can be built for any cutting length within commercial requirements. An attachment can be provided whereby the first end of the coil of tubing is trimmed off automatically before the first piece is cut to length.



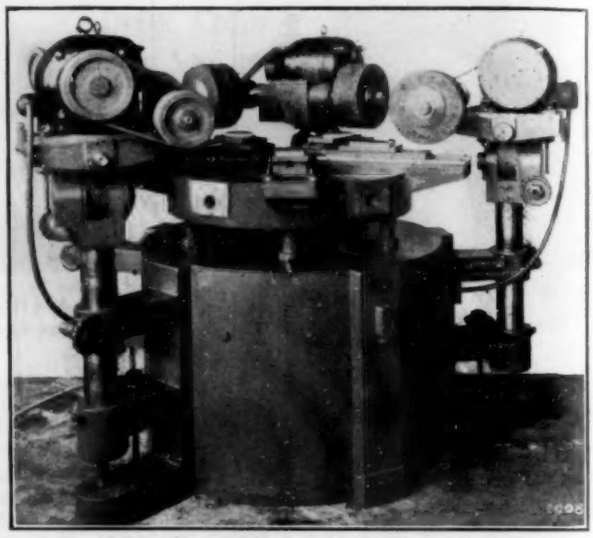
Automatic Tube Straightener

The machine is said to be well suited for handling copper tubings such as are used for feed pipes in automobiles, refrigerators, unit heaters, radiators, etc. Machines are furnished with a main driving motor and an individual motor-driven circular saw.

Universal Automatic Polisher

A new type of automatic polishing and buffing equipment, capable of performing a wide variety of jobs, is offered by the Hammond Machinery Builders, Kalamazoo, Mich. The machine is particularly adaptable to use in plants where a single-purpose automatic machine would not be useful due to variation in work, but where an automatic equipment which can be set up for a variety of shapes and sizes in comparatively short runs is desired. The new Hammond product is said to meet effectively the five principal requirements of an automatic polisher, i.e., presenting the work properly to the polishing wheel face; maintaining correct position of work against the wheel face; providing the yielding or "giving" effect of the human hand; passing the work across wheel face at correct feeding speed; redressing wheel face with composition at proper intervals.

The machine has a multiple-spindle arrangement, using several wheels. Set-ups are said to be easily accomplished and a high rate of production assured. The savings over hand work are stressed, as well as superiority of work in regard to uniformity of quality, etc.



Hammond "Universal" Polisher

Sheet Cleaning and Oiling Machine

The Gray sheet metal cleaning and oiling machine is made to treat any kind of metal sheets, including brass, bronze and aluminum. The machine is manufactured by the Gray Hub Company, 17265 Gable Avenue, Detroit, Mich. It comprises two brush rolls and two felt rolls, the upper roll running clockwise and the lower roll running anti-clockwise. The felt rolls at back of machine run in the opposite direction. Metal sheets are pushed between brush rolls until seized by the felt rolls which pull them through. A pan is placed under brushes to receive refuse brushed from sheets, while another pan is provided under felt rolls in which drawing compound may be placed if required to oil sheets. Lower felt roll impregnates upper one with compound which is spread evenly over entire sheet. Brush rolls run at 120 feet per minute and felt rolls run at 60 feet per minute. Machine is motor driven with chains and sprockets for speed reduction. Slotted guards are provided at front of machine so as to guide sheets directly between brush rolls.

An important saving is effected by this machine on the wear of dies and the consequent reduction in rejections from scratches both before and after finish enameling or painting of piece, the maker states. The metal sheets go through the machine at 60 feet per minute, cleaning them better than it can be done by hand, it is claimed. A considerable labor saving can be effected on the first operation.

Motor equipment is a 1 H. P. ball bearing, 1800 R.P.M., 60 cycle, 3 phase 220 volts.

Fume Recovery From Electric Furnaces

By E. H. de CONINGH

The Dust Recovering and Conveying Company, Cleveland, Ohio

The principal product of Pressed Metals of America, Inc., Port Huron, Mich., is extruded automotive bushings made of an alloy composed of copper, zinc, tin and lead. The component metals are melted in electric furnaces, and when the alloy is brought to specification, it is poured into a continuous molding machine of local design and construction. The cast blanks are forged or extruded into tubes, from which the various bushings are machined.

The furnace equipment consists of three Detroit electric furnaces of one-ton charge capacity each, which are well adapted to the service; but it became evident shortly after they were placed in operation that some means of fume control would be required. There is some continuous fume discharge while the charge is heating, and this is greatly increased when the slab zinc is added. The rocking of the furnaces also increases the oxide discharge, especially when the metal is poured. This indicated a loss of metal as oxide, which was recoverable, and created a health hazard which made working conditions in the foundry less desirable than in the other portions of the plant. The first equipment installed to remedy the situation consisted of a cyclone collector in series with fabric collectors, but this proved unsuccessful.

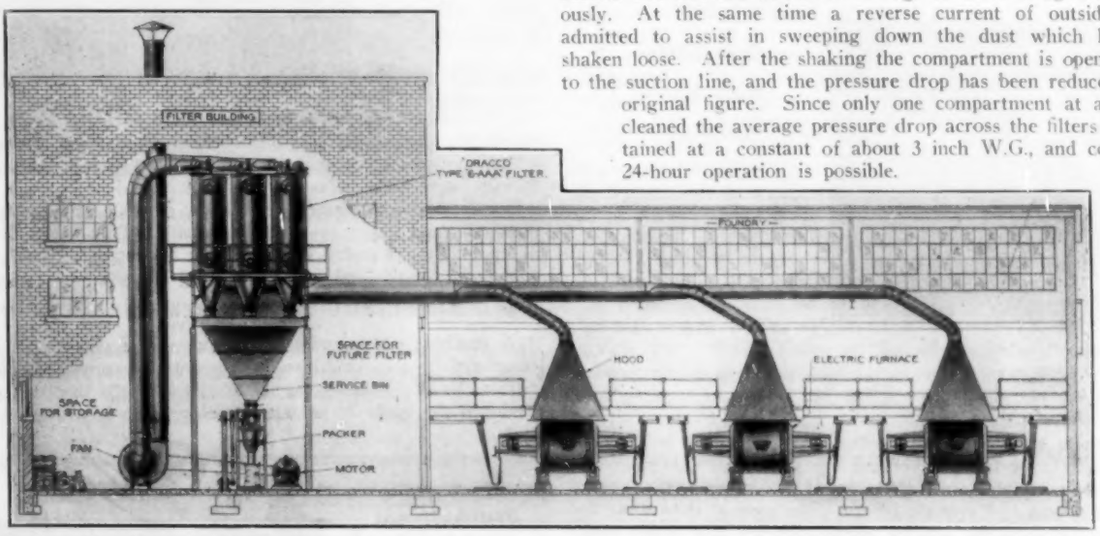


Diagram of "Dracco" Fume Recovery Equipment at Plant of Pressed Metals of America, Inc.

The fume recovery equipment shown in the accompanying diagram was then recommended by the metallurgical engineers of The Dust Recovering and Conveying Company, Cleveland, Ohio. The hoods were redesigned to permit complete oxidation of the metallic particles in the fume, and the cyclone collector was removed. The six-compartment "Dracco" filter is mounted over a service bin, under which is connected a bagging machine. The exhaust fan handles a maximum of 9,000 c.f.m. at a temperature of 180° to 200° F., and requires about 15 H.P. to drive it with all three furnaces on the suction line.

The operation of the system is easily followed in the diagram. As soon as a furnace is cut in, the exhaust fan is started, the ¼ H.P. motor for the filter cleaning mechanism is turned on, and the slide gate in the pipe line to the hood is opened up. The hoods are so constructed that sufficient atmospheric air is admitted to carry away the fume under the worst conditions, so practically none of the oxide escapes to the foundry. The mixture of air and oxide is carried through the main duct to the balloon section intake manifold. From this manifold, where the velocity is reduced, the mixture is drawn into the hoppers of the six filter compartments. A primary separation of the coarser particles takes place in these conical hoppers, and the air and fine dust is then drawn up through the filters. In each compartment eighteen cloth tubes, closed at the top, are suspended so as to open to the hopper below. The air and dust are drawn up into and through these tubes, which effectively retain the solids on the inside surfaces, and permit only cleaned air to pass through to the exhaust fan.

In order to maintain a constant static pressure at the exhaust hoods, it is necessary to remove periodically the dust which has accumulated on the surfaces of the bags. This is taken care of regularly and automatically by the compressed air actuated cleaning mechanism. Each filter compartment in turn is cut off the suction line and the whole set of bags or tubes is agitated vigorously. At the same time a reverse current of outside air is admitted to assist in sweeping down the dust which has been shaken loose. After the shaking the compartment is opened again to the suction line, and the pressure drop has been reduced to the original figure. Since only one compartment at a time is cleaned the average pressure drop across the filters is maintained at a constant of about 3 inch W.G., and continuous 24-hour operation is possible.

There is no visible dust in the discharge from the exhaust fan, and the recovery efficiency is 99 per cent plus of the entrained solids—even the finest particles. The intake manifold and the filter hoppers are open to the service bin, so all the collected material is delivered to one point. It is bagged in paper sacks and stored in one end of the building until sufficient quantity has accumulated to ship out. The zinc is the most volatile constituent of the alloy, so the recovered dust consists mostly of zinc oxide, with a low copper oxide content. It is a high grade material, containing 65 per cent to 70 per cent metallic zinc, readily marketable, and under normal operating conditions the daily recovery amounts to 1,800 to 2,000 pounds. This by-product reclamation shows an excellent return on the investment, in addition to the great improvement in working conditions.

The system is simple to operate, and after eighteen months of the service the operators write that "this equipment has been very satisfactory, and it has not been necessary to make any repairs."

Spray Finishers' School

A training school has been established for spray finishers by The DeVilbiss Company, Toledo, Ohio, manufacturers of spray painting and finishing equipment. The school will endeavor to teach correct methods of spraying paints, lacquers and other decorative and protective coatings. The school is open to owners, users and distributors of DeVilbiss equipment, no tuition fees being charged. Minimum course is three days, with a week's training period recommended to allow for thorough study. New classes start each Monday. Applications should be addressed to The DeVilbiss Company for assignment of entrance dates.

New Metal-Lined Tubing

A new method of lining steel tubing with a variety of metals or alloys, to accomplish results said to be never heretofore possible, has just been announced by the Detroit Seamless Steel Tubes Company, Detroit, Mich., which has secured exclusive patent rights to the process. Of particular importance in the application of this new process to industrial uses is the fact that in combining the inner lining metal with the outer steel shell the two are bonded by fusion so inseparably that there is not only no evidence of separation, but no manual means of destroying the union, the company states. Turnings made from the end of a tube so lined will curl off the tool so integrally united that the spiral formed shows both textures of the bonded metals as one continuous strip without fracture at any point between the two.

The greatest industrial possibilities of the process, according to C. H. Hobbs, president of the Detroit Seamless Steel Tubes Company, are undoubtedly to be realized through its exceptional advantages in the production of steel-backed bearings. Manufacturers with proper shop equipment can stock the lined tubes in

Cross Section of Steel Tube Lined with Copper Alloy by the "Brown" Centrifugal Process

lengths ready for their screw machine departments to produce bearings.

One of the important advantages claimed is the superiority of the texture of the lining metal, obtainable because it is cast into the tubing by a centrifugal process. It is pointed out that some manufacturers of electric motors have discontinued the use of solid bronze bearings because of the difference in expansion and contraction between the bearing metal and the steel shaft under operation. Using a steel-backed bearing produced by the Brown method, this difficulty will be eliminated, it is said. The shell being of steel, and the bearing metal a thinner layer of bronze, the bushing will expand in the same proportion as the steel shaft and thus maintain at all temperatures the proper bearing clearance.

The fact that a wide variety of metals and compositions can be utilized in the lining process renders the centrifugal lining method adaptable to many commercial uses aside from bearings. Among the lining materials already successfully used are bronze, copper, tin—in fact almost any alloy or non-ferrous metal. Practically every kind of bearing bronze can be used, the makers state.

Other uses for tubing so lined cover a wide range, among them tubes lined with non-corrosive metals for conveying liquids whose chemical properties deteriorate steel; tubes in boilers where a lining metal of high heat conductivity is advantageous; water pipes to displace tubes of copper or other material where strength is a desirable factor.

New Paint Spraying Equipment

Paasche Airbrush Company, Chicago, Ill., announces two new developments in spraying equipment. These are a new low-priced pressure feed tank for paint, having a patented "Clamptight" cover which is said to reduce opening and closing time 80 to 90 per cent as compared with nut-and-bolt covers; and a new ½ H.P. complete electric air finishing unit with patented expansion copper cooling coil, water and oil separator, for medium sized painting and finishing jobs. This is known as the F612 portable airpainting unit. It has a double cylinder compressor with 4.4 cu. ft. per minute free air capacity.

Readers may obtain complete data on these devices by addressing the maker directly.

New Foundry Squeezer

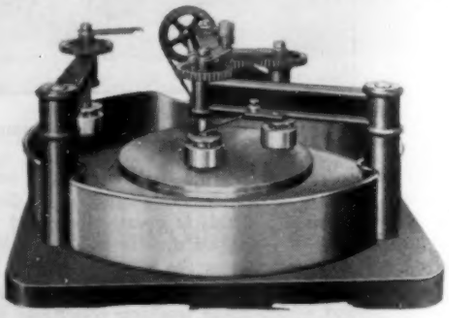
A new item has been added to the line of foundry squeezers manufactured by the Tabor Manufacturing Company, Philadelphia, Pa. This is the "Tabor Plain Squeezer" with cantilever yoke, furnished in both plain squeeze and jar squeeze types. The

New "Tabor Plain Squeezer"

maker states that the yoke is extremely easy of operation while remaining perfectly rigid. Other features stressed are three-point yoke support in squeezing position, readily adjustable ramming block, sand-proof construction. Standard equipment includes vibrator, pressure gauge, blow valve, riddle rack and shelf. Stationary or portable types are available. The machine was exhibited at the foundry convention in Chicago, May 4-7.

Automatic Metallographic Polisher

A machine for automatic polishing of metallographic specimens is offered by the American Instrument Company, Inc., 774 Girard Street, N. W., Washington, D. C. It is stated that the machine is designed to supply to private metallographic laboratories the same



New Automatic Machine for Polishing Metallographic Specimens

type of machine which the Bureau of Standards has developed as the result of research toward producing a polisher which can be readily used in any metallographic laboratory. It is stated that the Bureau's machine incorporated a number of new features which provide for increased efficiency, and that these are included in the machine now on the market. The polish obtained on specimens is said to approach the quality of polish found on optical lenses of high grade. Standard design makes it possible to furnish parts at all times. Ruggedness and adaptability are stressed.

Complete information is available from the manufacturer.

Factories Testing Laboratory

The Factories Testing Laboratory, 12th Street and Woodruff Avenue, Toledo, Ohio, offer complete technical services as analytical chemists and testing engineers, consulting chemists and metallurgists, consulting economic geologists, and appraisal engineers, to manufacturers and professional men. The firm states it is prepared to examine materials chemically and physically, develop processes, safeguard interests in development of mineral properties, and to examine and report on properties, particularly those involving chemical and metallurgical processes, for refinancing, rehabilitation, etc.

Equipment and Supply Catalogs

News About Anaconda Metals. The American Brass Company, Waterbury, Conn. Interesting tabloid circular.

Rust-i-cide. Rusticide Products, 5500 Walworth Avenue, Cleveland, Ohio. Leaflets on a chemical rust remover.

Power Transmission. Link-Belt Company, Chicago, Ill. Booklet, "A Saving at Every Turn," on positive drives.

Metal Cutting Band Saw. William Laidlaw, Inc., Belmont, N. Y. Type JM saw with hydraulic feed. Illustrated folder.

Better Castings. Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y. Circular alloy ingots of various types.

Pickling Equipment. The Weaver Brothers Company, Adrian, Mich. Circular on Monel metal pickling baskets and crates.

Aviation. Carl Byoir and Associates, 10 East 40th Street, New York. "Graphic Facts About Aviation," a booklet of statistics.

Lubrication. Alemite Corporation, 2650 North Crawford Avenue, Chicago, Ill. Booklet on industrial lubrication with "Alemite."

Pyrometer Tubes. Claud S. Gordon Company, 708 West Madison Street, Chicago, Ill. Circular on pyrometer tubes for foundry use.

Grinding and Heat Treatment. Norton Company, Worcester, Mass. These processes as causes of cracks in hardened steels. Illustrated booklet.

Automatic Control. The Brown Instrument Company, Philadelphia, Pa. Instruments for automatic control of temperature, pressure, flow, etc.

Indicating Thermometers. The Foxboro Company, Foxboro, Mass. Bulletin 148-2 on dial type thermometers and allied apparatus. Fully illustrated.

Jig Boring Machine. Keller Mechanical Engineering Corporation, 70 Washington Street, Brooklyn, N. Y. Pamphlet on "Kellocater," a jig boring machine.

Monel and Nickel. The International Nickel Company, Inc., 67 Wall Street, New York City. "Engineering Metals for the Process Industries," a 52-page book.

Commercial Lapping. Norton Company, Worcester, Mass. Complete information on lapping for close limits and high production, in an illustrated 62-page booklet.

Baird Machinery. The Baird Machine Company, Bridgeport, Conn. Automatic equipment for wire and ribbon metal forming. Tumbling barrels. Illustrated folder.

Alloy Steel Castings. The Duriron Company, Inc., Dayton, Ohio. Illustrated pamphlet on "Durimet," "Durco Nirosta," and other special analysis steels for corrosion, heat or pressure resistance.

Control Instruments. The Brown Instrument Company, Philadelphia, Pa. Broadside on a new indicating control instrument for high-temperature processes such as heat treating, baking, hot galvanizing, enameling, etc.

Construction Costs. Hartford Accident and Indemnity Company, Hartford, Conn. "Cutting Construction Costs," a 36-page folder prepared by the company's special risk department, on safety methods in construction.

Graduate Courses. Polytechnic Institute of Brooklyn, N. Y. 1931-32 bulletin of graduate courses in engineering, chemistry, physics and mathematics; day and evening. Also, Bulletin of the Evening Session, covering non-graduate work.

Anniversary Book. Pittsburgh Testing Laboratory, Pittsburgh, Pa. "Fifty Years of Service to Industry" is a beautifully printed and illustrated book covering the development and present facilities and activities of this company.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

Convention Plans

The Nineteenth Annual Convention of the American Electroplaters Society will be held at Hotel Seneca, Rochester, N. Y., June 29-30, July 1-2 1931.

There are two things which presage a successful convention, namely, a good program and a large attendance. The program depends on the convention committees, but the attendance depends on the Society at large. The Rochester Branch is working hard to put this convention over, and "We Are Going to Put It Over."

We assure all who attend a most satisfactory and profitable program. Whether you benefit by our efforts depends entirely upon yourself, so it behooves you to start making plans to attend, otherwise our efforts will be for naught.

You also have the opportunity of meeting personally the men who are working out problems in a scientific way, and of talking over the difficulties you may be having in some part of your daily routine. This is Your convention and for Your benefit, so do your share by attending. We Welcome You to this educational gathering and a good time.

Anyone wishing to present a paper please correspond with R. Lopez, 72 Wilbur Street, Rochester, N. Y. About exhibits, address H. Puffer, 126 Catalpa Road, Rochester, N. Y.

F. J. KOHLMEIER, Chairman, Publicity.

Testing Materials Society

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

Symposium on Temperature Effects

The 1931 annual meeting of the American Society for Testing Materials will take place at the Hotel Stevens, Chicago, Ill., on June 23.

One feature will be a Symposium on Effect of Temperature on Properties of Metals, intended to afford an opportunity to discuss the engineers' needs for alloys to withstand high temperatures and high stresses and what the possibilities and limitations of available alloys are. The symposium will comprise two sessions of the meeting, under the joint sponsorship of the American Society of Mechanical Engineers and the A.S.T.M. The program is being arranged under the auspices of the Joint Research Committee of the A.S.M.E. and A.S.T.M. on Effect of Temperature on the Properties of Metals with the cooperation of the various other committees and divisions of the two societies dealing with allied fields.

The various subjects will be fully dealt with in papers which will be preprinted in ample time for digestion before the meeting.

The symposium will deal with the subject from the engineering point of view, one session taking up the needs of the industry, the requirements of different industries and processes.

how far and by what alloys they are met at present, what needs are yet unfilled, and especially the trends of process development as affecting the materials of construction. That is, that session will put matters squarely up to the metallurgist, indicating to him what he must attempt to provide in the way of improved alloys for service at high and low temperatures.

At the second session the metallurgists will describe the good and bad properties of alloys now in use or ready for use, and will show what the user must do in the design and operation of equipment to make the most of the good qualities and minimize the effects of the poor ones.

This advance notice is designed to stimulate those who may have facts, opinions, queries or points of view to offer, to communicate with those in charge of the topic in which they are interested.

Session 1—The tentative outline of topics covers papers on trends in engineering requirements for metals at high and low temperatures.

The papers of this session will be summarized by L. W. Spring, Chief Chemist, The Crane Co., Chicago, Ill.

Session 2—The Properties of Available Materials for High and Low Temperature Service:

ZINC ALLOYS.—Harvey A. Anderson, Metallurgical Development Engineer, Western Electric Company, Hawthorne Station, Chicago, Ill.

ALUMINUM ALLOYS.—R. L. Templin, Chief Engineer of Tests, Aluminum Company of America, New Kensington, Pa.

BEARING METALS. E. R. Darby, Metallurgist, Federal-Mogul Corp., Detroit, Mich.

COPPER ALLOYS.—W. H. Bassett, Technical Superintendent and Metallurgist, American Brass Co., Waterbury, Conn.

OTHER NI BASE ALLOYS.—N. B. Pilling, Metallurgist, International Nickel Company, Bayonne, N. J.

RARE METAL ALLOYS.—W. H. Swanger, Metallurgist, Bureau of Standards, Washington, D. C.

THERMAL EXPANSION PROPERTIES OF METALS AND ALLOYS.—N. L. Mochel, Metallurgical Engineer, Westinghouse Electric & Manufacturing Co., Lester Station, Philadelphia, Pa.

BIBLIOGRAPHY OF RECENT PUBLICATIONS ON EFFECT OF TEMPERATURE ON METALS.—Lois F. McCombs, Bibliographer, Battelle Memorial Institute, Columbus, Ohio.

The papers of this session will be summarized by H. J. French, Metallurgist, International Nickel Company, Bayonne, N. J. Chairman, Joint High Temperature Committee.

N. Y. Section, Electrochemical Society

HEADQUARTERS, CARE OF RESTON STEVENSON, C. C. N. Y., 140TH STREET AND CONVENT AVENUE, NEW YORK CITY

The next meeting will be held at 8 p. m., on Friday, May 22nd, at the Westinghouse Lighting Institute, at Grand Central Palace, 46th street and Lexington avenue, New York City. The program consists of a talk by Dr. A. Brann of the Engineering Department, Westinghouse Lamp Company, on "The Chemistry of the Incandescent Lamp," and an address by Dudley Willcox, treasurer and assistant manager, Ajax Electrothermic Corporation, on "Recent Coreless Induction Furnace Developments."

After the meeting, the "City of Light," of the Westinghouse Lighting Institute, will be exhibited. Ladies are invited.

The Wire Association

HEADQUARTERS, 551 FIFTH AVENUE, NEW YORK CITY

The annual meeting and exhibition of The Wire Association will take place at the Auditorium, Cleveland, Ohio, June 15 to 19, inclusive. There will be technical sessions and discussions, operating exhibits of wire drawing and forming machinery, insulated wire and cable machinery, dies, reels, lubricants, wire mill equipment, etc.

Official hotel will be Hotel Cleveland, where Association headquarters will be maintained during the meeting. Reduced rail fare certificates available. Inquiries should be made to Richard E. Brown, secretary, 551 Fifth Avenue, New York City.

Pacific Northwest Metal Trades

United Metal Trades Association of the Pacific Northwest held a one-day business session in Portland on April 25th. The major problem discussed was how to maintain present wage scales of the industry in the Northwest, in the face of Eastern competition. The problem also involves further development of foreign markets for Northwest metal products. Approximately 100 of the largest metal trades plants in Seattle, Tacoma, Spokane, Everett and Portland were represented. F. K. HASKELL.

Personals

Benjamin Lowenstein

In 1883, Benjamin Lowenstein established the Nassau Smelting and Refining Works on West 16th Street, New York City. It was a small concern dedicated to the reduction of scrap metals, and in operating it, Mr. Lowenstein was one of the pioneers of his industry, now one of the most important, economically, that the country can boast. Being a progressive man, his company has prospered, until today, as the Nassau Smelting and Refining Works, Ltd., it is one of the world's leading manufacturers of non-ferrous ingots. It is still headed by its old proprietor, Benjamin Lowenstein.

The growth of the Nassau company corresponds, in fact, to the growth of the American secondary metals industry. When Mr. Lowenstein established his firm the knowledge of metallurgical qualities was indeed limited, and scientific methods of metal handling were unknown. Rule of thumb was the practice in the scrap business, as it was in the business of converting scrap into usable material. Ingot metals had not yet gained the reputation for uniformity which they have today. Mr. Lowenstein wisely discerned the poor status of the industry in which he was engaged, even in those distant years, and he set some precedents for which the secondary metals industry as well as all users of ingot metals may well bless his name. He began to treat his business scientifically, insisting on uniformity of ingot quality. He kept in mind the requirements of the consumer. He slowly brought both producers and consumers of ingot metals to see the superiority of his methods and ideas. Sixteen years after his modest beginning, Benjamin Lowenstein organized another company, which today is also a leader in the industry, the Tottenville Copper Company, with offices in New York City and a very large, modern plant at Staten Island, N. Y. It was one of the first ingot producing plants to have a laboratory for scientific control of its operations as well as for research. Specialization was the underlying principle of the Tottenville plant, each of its divisions being headed by a specialist in a definite branch of the ingot industry. This was

BENJAMIN LOWENSTEIN

Mr. Lowenstein's aim realized: to produce metals for definite requirements by scientific methods.

Mr. Lowenstein has identified himself with a number of other enterprises, such as the Safety Insulated Wire and Cable Company, which he controlled until it became a part of the General Cable Corporation. He sponsored the Chicago Bearing Metal Company, later acquired by the National Lead Company. In every venture he has maintained his capacity for the broad view of things, the foresight which marks the leader. "B. L." is a by-word in the ingot metal industry. The initials of Benjamin Lowenstein are a synonym for progress.

Robert T. Kent, director of sales and engineering, Divine Brothers Company, Utica, N. Y., is now vice-president.

Lewis T. Briggs has resigned as vice-president of Erie Bronze Corporation, Erie, Pa., and has disposed of his interest to **Bert C. Edkin,** who continues as president.

Blaine Zuver has been elected a director of the Reliance Manufacturing Company, Massillon, Ohio. Mr. Zuver is chairman of the enterprise Aluminum Company, Massillon.

L. W Kempf, Aluminum Company of America, spoke on "Aluminum and Its Alloys" before the Utica Local Section, American Society of Mechanical Engineers, on March 18.

V. W. Collins, assistant comptroller, General Cable Corporation, Rome, N. Y., and president, National Association of Cost Accountants, was guest of honor at the March dinner meeting of the Milwaukee chapter of the Association.

Dr. P. V. Faragher spoke on "The Structural Application of New Aluminum Alloys" at the March 26th meeting of the Waterbury Local Section, American Society Mechanical Engineers. Dr. Faragher is with the Aluminum Company of America.

Dr. E. F. Northrup sailed on the Caronia, March 20, for a two months' business and pleasure trip to Europe. Dr. Northrup is vice president and technical adviser of the Ajax Electrothermic Corporation, Trenton, N. J. He will visit his company's various European agents.

Conrad A. Hanson, general manager of Mergenthaler Linotype Company, Brooklyn, N. Y., will head the metals and machinery division for the Brooklyn section of the 1931 maintenance campaign of the Salvation Army in which $528,000 will be sought for the support of the 52 permanent centers of the Army's work in Greater New York.

John F. Blackie has been appointed executive vice-president National Enameling and Stamping Company, Milwaukee, Wis. This is a newly created position. Mr. Blackie has been manager of manufacturing for the past six years with headquarters in St. Louis. He is to return to Milwaukee, but will spend part of his time at the other works of the company, in Granite City, Ill., and in the East.

Obituaries

William Augustus Cook

William Augustus Cook, rolling mill expert, widely known in the New England and New York metal industries with which he was identified for many years, died last month at the age of 78. Mr. Cook was one of the first subscribers to THE METAL INDUSTRY, at whose offices he has been a frequent and extremely welcome visitor.

WILLIAM A. COOK

Mr. Cook, one of that fast passing generation who did so much to make the American metal industry what it is today, began his career with Holmes, Booth and Hayden, silverware manufacturers, now part of the International Silver Company. Peter Hayden of that company was Mr. Cook's uncle. Later, for fifteen years, he was with the Scovill Manufacturing Company, Waterbury, Conn. He left that company to become president of the Manhattan Brass Company, New York. During and after the World War, Mr. Cook was with Matthiesen and Hegeler Zinc Company of LaSalle, Ill., as New York representative. Some years ago he retired from business.

Patrick Henry Robinson

Patrick Henry Robinson of 82 Farmington avenue, Waterbury, Conn., superintendent of the Plumbers' Brass Goods division (formerly American Pin Company) of the Scovill Manufacturing Company, died in that city April 17, 1931, after a long illness. A chronic ailment which kept him confined for five months required an operation from which he did not rally.

Mr. Robinson came to Waterbury when quite young, entering Scovill's 27 years ago, becoming successively foreman, assistant master mechanic, superintendent of the planning department, superintendent of the Matthews and Willard division, superintendent of the vacuum cleaning and electrical apparatus department, superintendent of the Hamilton-Beach plant at Racine, Wis., and finally superintendent of the Plumbers' Brass Goods division.

He is survived by his widow, a daughter and two sons.

W. R. B.

Harry Lloyd Benedict

By the death of Harry L. Benedict, the silverware industry has lost a prominent and engaging figure. Since early manhood Mr. Benedict had been president and general manager of the Benedict Manufacturing Company, East Syracuse, N. Y.; also vice-president of the Benedict-Proctor Manufacturing Company, Ltd., Trenton, Ontario, Canada. The products of both corporations were silver plated ware and art metal novelties.

Mr. Benedict was born in Saratoga, N. Y., August 20, 1873, and went to Syracuse with his parents as a boy. After graduation from high school he entered the school of architecture at Syracuse University, and shortly after graduation he inherited the manufacturing business established in 1895 by his father, the late M. S. Benedict.

Aside from his sentimental pride in his inherited industry, Mr. Benedict devoted to it a fine artistic taste and an enthusiasm for good workmanship on the part of his craftsmen, and these, combined with his business ability, contributed distinctively to the high repute of Benedict products. Under his guidance the company grew to be one of the leading concerns of its kind in the country.

Kindly and affable in temperament, and staunch in his friendship, his death in the full prime of life has been a source of genuine sadness to all who were familiar with his attractive personality.

A. FREDERIC SAUNDERS.

J. H. MILLER

J. Howard Miller

J. Howard Miller, superintendent of the rolling mills and extruded rod mill of the Scovill Manufacturing Company, Waterbury, Conn., died February 16, 1931, after an extended illness. He was 42, and had been with Scovill's for 25 years.

Mr. Miller was born at Bristol, Conn., in 1889. He went to Waterbury in 1905 and entered the company's casting shop as errand boy. He progressed steadily, until in 1915 he was placed in charge of the extruded rod and East rolling mills. His authority was further extended as the years went by. Mr. Miller was highly esteemed by his co-workers in the company.

Newell S. Thomas

Newell S. Thomas, 49, executive of Revere Copper and Brass, Inc., and widely known Central New York golfer, died in his office the morning of April 24, 1931, from a heart ailment. He was born in Rome and started his career with the Rome Brass and Copper Company, remaining when the company was reorganized. Since the reorganization he held the positions of assistant treasurer and assistant sales manager.

E. K. B.

News of the Industry

Industrial and Financial Events

Developments in Metals

PURE ALUMINUM has been adapted to the manufacture of terrestrial globes by C. S. Hammond and Company, Brooklyn, N. Y. No. 16 gage aluminum discs are spun into hemisphere and fastened together by means of a flanged sheet steel disk and a length of light brass tubing.

DURALUMIN masts and booms of chrome molybdenum steel will be used in rigging three sloops of the New York Yacht Club which will compete in Class M yacht races. Other innovations in yacht construction will be corrosion prevention by immersing corrodable parts in an electrolytic chromic acid bath, it is reported.

ALUMINUM ALLOY railway cars are being built by Waggonfabrik, A. G., Uerdingen, Germany, to provide about 50% reduction in weight as compared with wood. Bodies and chassis are of aluminum-copper-zinc alloy; axles, wheels and springs are steel; Diesel engine drive; 55 to 70 passenger capacity; German Railway Administration reports savings of 20% to 40% in operating costs on these cars.

A STRUCTURAL ALUMINUM alloy containing 4.75 to 5.25 silicon, .35 iron, balance aluminum, made in Switzerland, is being offered in this country, it is reported. The importer is said to have declared it to be the first alloy of this kind imported into this country.

UNITED STATES TARIFF COMMISSION will investigate production costs on aluminum-silicon alloys to determine the adequacy of the present rate of duty.

DR. J. W. M. DU MOND of California Institute of Technology last month told the Pasadena (Calif.) Astronomy and Physics Club that the gyrations of electrons in metals have been photographed by means of a special spectrographic X-ray device he developed in collaboration with HARRY KIRKPATRICK after two years of research.

SANDVIK STEEL WORKS of Sweden has bought Scandinavian rights to a new method for aluminizing cold-drawn tubes and strip steel for corrosion resistance. Method surfaces the steel with aluminum which also penetrates the steel.

MOND NICKEL COMPANY of England has put into operation in West London, England, the world's largest precious metals refinery, capable of supplying three-fourths of a world's demand for platinum and platinum-group metals, using Canadian ore.

COPPER CONSUMPTION in 1930 was 958,850 short tons, as against 1,159,800 short tons in 1929, a drop of 17%, according to American Bureau of Metal Statistics.

NATIONAL METAL EXCHANGE, New York, has started trading in silver futures, the first organized market of its kind.

"COPPER FOR VERTICAL STRUCTURES" was the subject of an address by Thomas E. Orr, delivered at the recent annual convention of the New York State Sheet Metal Contractors' Association. The modernistic trend in architecture is slowly but surely introducing sheet metal for exterior trim and new elements of design, Mr. Orr stated.

A CHAIN HOIST OF ALUMINUM, said to be the first in the field, has been introduced by Chisholm-Moore Hoist Corporation, Tonawanda, New York, under the name "Al-Lite." It is said to be a third lighter than other hoists of this type, and to have unusual strength and efficiency. Only certified Alcoa alloys are used for its manufacture. It is claimed to stand a 50 per cent overload. One man can carry it and hang it in place.

Handy and Harman Personnel Changes

John F. Harman, chairman of the board of directors of Handy and Harman, New York, silver concern, and Joel L. Brush, treasurer of the company, retired on May 1. Mr. Harman is now 87 and had been with the company for 64 years. He will continue as a director. Mr. Brush has been with the company since 1900, and was made treasurer in 1915. He is succeeded as treasurer by Howard W. Boynton. The other officers of the company are Cortlandt W. Handy, president; Gustave H. Niemeyer, vice-president; H. Walter Spaulding, secretary.

Big Aluminum Works for Japan

An aluminum plant with annual capacity of 10,000 tons will be constructed on the Yalu River, in Chosen, Japan, according to a recent dispatch from Hamburg, Germany, where inquiries are said to have been made for machinery and equipment for the project. The Japanese government is making the negotiations, it is stated.

Incorporations

Imlay City Manufacturing Company is preparing to begin operations. Company will manufacture brass, bronze and aluminum castings and operate brass machine shop. B. L. Stanford is head of the concern.

Calibron Products, Inc., East Orange, N. J., has been organized by **Theodore M. Edison, 106 North Walnut Street, East Orange, son of Thomas A. Edison.** Associated with him are S. W. Landon and E. D. Martin, both of West Orange. The company will manufacture and carry on experimentation in electrical, mechanical and other equipment.

Joseph C. Buckley, 185 Benefit Street, Providence, R. I., and associates have organized **Stackbin Corporation,** to operate local plant for the manufacture of bins, cans and other metal containers. **W. C. Benson,** Providence, is interested in the new organization. Tool room and stamping departments will be operated.

Corporation Reports

Aluminium, Ltd., Canada, 1930 net income of company and wholly owned subsidiaries, $968,567 after charges, against $2,379,020 in 1929.

Anaconda Wire and Cable Company, 1930 net income, $278,992 after all charges, against $1,965,082 in 1929.

Union Metal Manufacturing Company, Canton, O., 1930 net profit, $260,906 after charges, against $249,298 for 1929.

Parker Rust Proof Company reports for three months ended March 31, net earnings after preferred dividends, depreciation and all charges, but before Federal taxes of $208,830, compared with $155,797 last year.

Bohn Aluminum and Brass Corporation. Quarter ended March 31, 1931; profits, $437,296 after all charges, as against $395,386 for same 1930 period.

General Cable Corporation voted to omit the dividend of $1.75 on preferred stock due at end of first quarter of 1931. Directors felt it wise to conserve working capital at present resumption of payments is fully expected with revival of business.

General Cable Corporation reports for quarter ended March 31, 1931, net loss of $697,965 after interest, depreciation, etc., comparing with net loss of $487,253 in first quarter of 1930.

Scovill Manufacturing Company, 1930 net earnings, $506,618 after charges, equal to 57 cents a share on outstanding stock, as against the equivalent of $4.65 a share in 1929. President E. O. Goss said: "Operations were affected by curtailment of production, heavy decline in prices, difficulty in operating plants under reduced program, and liquidation of inventories . . . Management has made effective many economies. It is felt future operations will show more favorably. . . . "

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

MAY 1, 1931.

One additional director was elected at the annual meeting of the **Scovill Manufacturing Company** last month, A. L. Adams of Naugatuck, who is active in the **J. H. Whittemore Company.**

Most departments of the **Waterbury Clock Company,** according to notices received by the employees, will close from May 1 until some time in July. Many of the departments have been on a three-day week schedule for the past month. The company is moving most of its New York office force to this city, maintaining but a skeleton organization in that city.

Officials of the **Scovill Manufacturing Company** deny a recently circulated rumor that all married women employed by the plants are to be dismissed.

Frederick S. Chase, president of the **Chase Companies, Inc.,** told the Rotary Club at its meeting last month of his recent trip of inspection through some of the Kennecott copper mines in the southwest.

Among patents granted local inventors during the past month are the following: **George Boden,** Scovill Manufacturing Company, pin holder; **Floyd Rasmussen,** holding lug for railroad telltale rods; **William Simpson,** Hoffman Specialty Company, blast trap; **Richard L. Wilcox,** Farrel Foundry, clearance mechanism; **Adolph C. Recker,** Chase Companies, metallic packing ring for slip joint pipe connection; **Zenas Candee,** cutting machine; **Forrest G. Purrinton,** button; **Frank E. Warner** and **P. E. Fenton,** button; **Frederick Wehrlinger,** ratchet machine for timepieces; **Richard L. Wilcox,** compensating mechanism and threading machine. **Scovill Manufacturing Company** was granted a trade mark for cigarette snuffers and ash trays and has applied for a trade mark for sheet brass and unfinished forgings.

Scovill Foremen's Association held its first annual gambol April 10th at Doolittle Alley hall. The committee in charge included T. B. Armstrong, J. F. Burns, W. C. Carew, H. Davison, M. F. Hanley, R. C. Jeter, R. M. Kamack, D. C. MacIntosh, W. P. McKenna, W. D. Hobbie, F. E. Missel, J. F. Moran, J. D. Robinson and P. J. Wallace.

Over 500 local plant foremen attended the annual dinner of the Industrial Foremen's Club last month. **Dr. Harry Myers** of the **Ohio Brass Company** spoke.

An Associated Press survey of business conditions during March notes the receipt of larger orders by the **American Brass Company** of this city and Torrington, and by the **Bridgeport Brass Company,** Bridgeport.

Waterbury was the second most important manufacturing city in Connecticut in 1930, exceeded in value of output only by Bridgeport, and leading Hartford and New Haven, according to a report of the United States Census Bureau. It shows the city had 182 manufacturing establishments giving employment during the year to an average of 24,396 persons, whose wages aggregated $32,993,421, spending $86,241,843 for materials, fuel and electricity, and having an output valued at $157,587,994.

W. R. B.

Connecticut Notes

MAY 1, 1931.

BRIDGEPORT—Bridgeport was the first manufacturing city in the state during 1930, according to figures given out by the United States Census Bureau. It had 339 manufacturing establishments, gave employment to an average of 30,577 persons, whose annual wages aggregated $39,309,730 and had an output valued at $176,258,794.

Locomobile Company of America plant in this city will be sold June 3 by order of the superior court. This is the result of foreclosure proceedings brought by the First National Bank and Trust Company of this city. The mortgage plus accrued interest amounts to $903,361. The plant has been idle for some time.

NEW BRITAIN—Announcement is made that the **American Hardware Corporation** has contracted for the purchase of the factory of the **Springer Lock Manufacturing Company** of Belleville, Ontario, which employs about 125 workmen and manufactures locks and builders' hardware.

Reports that the **Stanley Works** contemplated a cut of 10 percent in all wages and salaries were denied by **President Clarence F. Bennett** last month. He admitted that adjustments had been made in the pay of most departments, but said there was no general cut. The salaries of the office employes and the wages of most of the employes of the **P. & F. Corbin Division** have been cut.

TORRINGTON—Lyman Comstock, former assistant sales manager and former manager of the Torrington branch of the **American Brass Company,** who has been missing for nearly two years and who was thought to be dead, has turned up in a town near Houston, Texas. His relatives, believing him dead, not long ago petitioned the probate court to have a trustee appointed for his $37,500 cash estate. The inventory showed many stocks in excess of this figure and many uncashed dividend checks. He was located by appearing at a bank in Houston to dispose of some of his securities.

Torrington Company has completed negotiations for the purchase of the **H. Lydall and Foulds Company** of Manchester, manufacturers of knitting machine needles. It was established in 1855 and is said to be the oldest concern in this line. **W. R. Reed,** president of the local company, said that eventually the business and equipment will be moved here.

HARTFORD—Hartford was the third largest manufacturing city of the state in 1930 according to figures made public by the United States Census Bureau. It had 363 manufacturing plants, employing 24,744 persons, who received wages of $36,023,307 and had an output of $157,241,974.

Underwood-Elliott-Fisher Company reports net income of $705,600 for first quarter of 1931, compared with $1,367,013 for the same period last year. This is after Federal taxes and all charges.

Colt's Fire Arms Manufacturing Company is to begin deliveries within 30 days on a new light weight aircraft gun for the United States army. The guns are already in production,

the machine gun division having been tooled up for this purpose during the past year. The plastic division continues to operate three 8-hour shifts. A development in this department is a new line of molded buttons for garment manufacturers.

NORWALK—Segal Lock and Hardware Company has started on a production schedule of 200,000 razor blades and 5,000 safety razors daily. Machinery recently perfected is being installed which will give an output of 60,000 blades every eight hours. Two men attend a machine. It contemplates using the company's plant in Brooklyn exclusively for the safety razor business, concentrating all its other hardware production operations at the local plant.

Lockwood Manufacturing Company, hardware manufacturers, has closed its New York office and has transferred the business to this city. **Richard Battin** of Whitestone, L. I., has has been elected treasurer, succeeding **Charles Beaver.**

Standard Safety Razor Company of East Norwalk is now operating with a night shift working eight hours and a day shift working nine hours. Employment is given to 125 persons. **Charles A. Williams** of Brooklyn, N. Y., has been elected president to fill the vacancy caused by the death of **D. M. Mason.**

NEW HAVEN—New Haven was the fourth manufacturing city of the state during 1930, according to figures made public by the Federal Bureau of the Census. It had 494 manufacturing plants, employed 27,141 persons, whose wages were $42,899,091, and had an output valued at $135,894,115.

ANSONIA—American Brass Company started work last month on the construction of a new wire mill. This will be one of the units in a new plant rebuilding program of the company here.

WINSTED—Norman Stevens of this city has been granted a patent on a clock mechanism which he has assigned to the **W. L. Gilbert Clock Company.** W. R. B.

Providence, Rhode Island

MAY 1, 1931.

The end of April, with the advent of spring and early summer activities, finds business prospects among the metal trades in this city and vicinity brighter, although only slightly, it is true.

One of the most encouraging factors in the local situation comes through the announcement made a few days ago that the **Gorham Manufacturing Company** had started the dismantling of its subsidiary plant of the **Durgin Silver Company** at Concord, N. H., which would possibly give longer working hours in the near future and additional employment when business conditions become more normal. The machinery from the Concord plant is being removed to the company's local plant at Elmwood, where there is ample floor space to accommodate it. The Durgin Division has been producing silverware similar to that produced in this city. The consolidation of manufacturing facilities will effect a considerable saving in operating expenses and will also benefit Providence employes of the concern. The intention of closing of the Concord plant, announced some time ago but deferred at the request of New Hampshire state officials, marks the termination of a 78-year career of the company in that city. In normal times the plant has employed between 200 and 300 persons.

Warwick Brass Foundry, Inc., Lincoln Park, Warwick, is completing erection of a new machine shop building 24 by 50 feet, and is installing machinery in its jobbing foundry. This is the latest step in the rebuilding of the foundry, partially destroyed by fire about two years ago. The plant is now equipped with several fire-proof buildings of ample size, and with the most modern arrangements for the casting of brass, bronze and aluminum.

Daniel H. Morrissey, a local attorney, has been appointed receiver for the **Rex Manufacturing Company** and the **Modern Molded Products Company, Inc.,** on petitions filed by **Harry M. Burt,** stockholder, who states defendant companies are insolvent.

At a recent meeting of the creditors in bankruptcy of **Arsen G. Avedisian,** doing business as the **Providence Brass and Aluminum Foundry,** in Providence, Barnard B. Abedon was appointed trustee.

Phillips Wire Company has filed notice with the Secretary of State's office of a reduction in capital stock from 2,000 shares of common no par value stock to 100 shares of same.

National Manufacturing and Electro-Plating Company, 16 Calendar Street, is owned by **Rose S. Smith,** according to information filed at the city clerk's office.

Involuntary petition in bankruptcy has been filed against **L. Brayton Foundry Company,** West Warwick.

Atlas Sheet Metal Works, Inc., of Providence has made a general assignment to **Walter W. Goff** for the benefit of its creditors. No statement has been made as to the assets and liabilities.

Jonas Saliet, attorney, has been appointed temporary receiver for the **Realart Fittings Company,** following application for receivership filed by a creditor in the sum of $77.99. The petition stated that the corporation is insolvent. W. H. M.

Middle Atlantic States

Trenton, New Jersey

MAY 1, 1931.

Few of the metal plants in New Jersey are running to capacity. **The Trenton Brass and Machine Company** is not operating a full week, but the employes work from three to five days a week. **J. L. Mott Company** is running but three days a week. **John A. Roebling's Sons Company** is also operating below normal.

William H. Schulte, president of the **Trenton Brass and Machine Company,** has been granted a patent on a flush valve which the patent office at Washington, D. C., recognized as having three patentable features. The patent had been pending since February 25, 1929.

Metal Edge Fibre Products Company, 28 West State Street, Trenton, has been incorporated with 100 shares of preferred stock at $100 a share, and 10,000 shares of common stock, to manufacture metal-edge fibre products.

Following concerns were incorporated at Trenton: **U-Neek Chemical Company,** chemicals; $50,000; Bound Brook. **Triangle Wire Die Company,** manufacture dies; $100,000; Jersey City. **American Testing Company,** chemicals; 100,000 shares common; Jersey City. **Auto Reflecto Tail Lights, Inc.,** manufacture auto lights; $100,000; Ventnor. C. A. L.

Newark, New Jersey

MAY 1, 1931.

Vice-Chancellor Church has appointed Albert G. DeRonde receiver for the **Radio Tube Products Company,** 102 Murray Street, and will ask interested parties to show cause why the receivership should not be continued.

Lovell-Dressel Company, Arlington, N. J., has been granted a contract by the Department of Commerce at Washington for 1,650 reflectors to be used in lighting effects on aviation fields and airways.

Allied Tar and Chemical Corporation is rebuilding its brick factory at Elizabeth at a cost of $50,000. **Mallinckrodt Chemical Works** will erect a two-story addition, 75 by 155 feet, at Jersey City to cost $40,000. **Walker-Turner Company,** Jersey City, will alter its tool manufacturing plant at Plainfield, N. J., at cost of $40,000.

Following Newark concerns have been incorporated: **William G. Dixon and Company,** manufacture radio supplies; $125,000. **George C. Shuster Manufacturing Company,** metal novelties; $100,000. **Reinhold Corporation,** manufacture chemical products; $250,000. **Republic Radio Tube, Inc.,** manufacture radio equipment; 2,000 shares common. **Reo Chemical Company,** chemicals; $100,000. C. A. L.

Central New York

MAY 1, 1931.

A decided trend toward the purchase of copper pipe was reported this month by **W. Edmond Stradling**, Utica, retiring president of the Master Plumbers Association, who presided here April 14 and 15 at the state convention of the association attended by about 500 plumbers and their wives. Plumbers expressed interest and willingness to use more of the copper product in discussions held during the two-day conclave. Nearly half of the delegates visited Rome in buses provided by **Revere Copper and Brass, Inc.**, to view their plants in operation. Exhibits of this firm were also shown at the convention headquarters on the mezzanine floor at Hotel Martin. The master plumbers elected **William Wolff**, Brooklyn, their new president.

Official figures of the Industrial Association of Utica, which makes a feature of compiling the metal trades employment charts each week, show that Rome is marking time while Utica metal trades are forging slowly ahead. The average for Utica shows that February 14 the percentage employed as compared with normal was 69.9, while the April 18 figure for Utica was 74.8 per cent.

The most marked improvement in employment during the past few weeks was in evidence at the **Utica Cutlery Company** and the **Bossert Corporation.** A steady decline has been reported at the **Savage Arms Corporation,** but the third week in April revealed a slight rise.

Business men of this area attended the annual dinner of the **Utica Chamber of Commerce** at Hotel Utica, when confidence relative to business conditions based on unmistakable signs of replacement buying of essentials was expressed by **Pierrepont B. Noyes,** president of **Oneida Community, Ltd.**

E. K. B.

Middle Western States

Detroit, Michigan

MAY 1, 1931.

The non-ferrous metal and plating industries have shown some improvement during the last four weeks. Just how far it will extend remains to be seen. Most of the improvement, as might be expected, is due to the gradual increase in production in the motor car field. Not so favorable reports, however, come from other lines of industry.

The motor car accessory plants have been quite busy of late and seem to be improving right along. This is true not only in Detroit but throughout the state as well. Favorable reports come from Flint, Jackson and Pontiac.

Service Sales and Engineering Company has recently been incorporated in Detroit for the purpose of manufacturing and dealing in foundry and industrial plant supplies and equipment. The owners are Harry F. Belsher, William T. Cross and Thomas H. Libbey.

A safety device for automobiles has recently been perfected by the **Star Lamp Company** which will be incorporated with a capital of $200,000. It is a lamp which may be attached to the rear of any car just as an ordinary tail light, but which serves as a tail light, stop light and direction indicator, to indicate to the driver of the car behind his intentions when about to make a right or left turn.

Eighteen months' operation in its own plant, during which time its efficiency was thoroughly tested, has resulted in the marketing by the **General Spring and Bumper Company,** Detroit division of the **Houdaille-Hershey Corporation,** of a new polishing wheel set-up machine. This machine was designed originally to effect an economy in operation in the General Spring plant. Its success has justified officers of the company in placing it on sale, it is stated. It fills the need for a mechanical device which will apply abrasive economically and uniformly to polishing wheels. It is particularly helpful in plants producing highly finished materials for the automotive industry, it is stated.

James L. Mahon, president of the **American Car and Foundry Company,** was elected president of the Detroit Foundrymen's Association at the recent annual meeting held at the Fort Shelby Hotel. Other officers elected were: **Peter W. Mulder,** vice-president; **Neil McArthur,** secretary; and **Fred A. Cowen,** treasurer. Directors: Clarence H. Miller, Leslie G. Korte, Russel M. Scott, Vaughn Reid, Harry Rayner and Fred J. Walls.

With three new models as leaders, the **Independent Stove Company,** Owasso, Mich., has obtained orders from dealers at various conventions held during recent months to secure steady operation of its plant on a normal basis for months to come, according to **J. Edwin Ellis,** president and general manager.

Columbus Metal Tire Cover Company, 11111 French Road, Detroit, has recently been incorporated for the purpose of manufacturing a new type of tire cover. The incorporators are **H. H. Copeland, Jr.,** Columbus, O.; **O. F. Grothkopf** and **Carl C. Kreba,** Detroit.

Parker Rust Proof Company, Detroit, broke all records last year so far as production is concerned. Its operations thus far in 1931 indicate that this year will witness the establishment of a new high mark in both sales and profit, it is announced.

F. J. H.

Cleveland, Ohio

MAY 1, 1931.

Business here improved during the past quarter, according to Col. Leonard P. Ayres, of the Cleveland Trust Co., in a recent monthly survey of prevailing conditions.

Manufacturing in general is showing some improvement in this area, although it has not yet reached the stage that was expected a few months ago. The greatest betterment is found among the motor car accessory manufacturers, although not many are operating at capacity.

F. J. H.

Wisconsin Notes

MAY 1, 1931.

John F. Blackie, for the last six years manager of manufacturing of the **National Enameling and Stamping Company's** five plants, has been named executive vice-president, according to an announcement by **Alfred J. Kieckhefer,** president.

R. J. Giddings, formerly associated with the **Badger Wire and Iron Works,** Milwaukee, as vice-president and sales manager, has become associated with the **Wisconsin Art Bronze and Iron Company,** Milwaukee, in a similar capacity. Mr. Giddings has been associated with the ornamental bronze and iron industry 18 years.

John Wegner, Jr., 56, sales manager of the **National Enameling and Stamping Company,** Milwaukee, died suddenly April 19 from a heart attack. Mr. Wegner had been connected with the concern for 31 years. He is survived by his wife and two sons.

August C. Willert, 78, chief engineer of the **Aluminum Goods Manufacturing Company,** Manitowoc, died April 2, following a three weeks' illness. Mr. Willert was affiliated with the Vits interests for 58 years. He is survived by his widow, six daughters and two sons.

Paul L. Goethel, manager of the wash boiler division of the National Enameling and Stamping Company, Milwaukee, recently celebrated 50 years of uninterrupted service with the concern. His fellow workers presented Mr. Goethel with an engraved watch and chain.

A. P. N.

Other Countries

Birmingham, England

APRIL 20, 1931.

The report of **H. H. Vivian and Company, Ltd.,** well-known Birmingham non-ferrous metal rollers, shows a balance of the profit and loss account for the year to December 31, 1930, after charging interest on debentures of £1,350, is a debit balance of £3,091. After deducting this amount from the credit balance of £3,743 brought forward from last year there is a credit balance on profit and loss account of £652. The general reserve fund has been reduced to £13,000 by the transfer of £2,000 to cover depreciation for the year. The directors state that during the year the great fall and fluctuation in the price of copper caused unavoidable losses to the company. During the first half of the year most departments were fairly well employed, but later the increasing depression in all trades, especially in the shipping world, had a serious effect on sales. New modern plant has been installed and is working satisfactorily.

The tone of the metal market continues quiet and there is very little new business. Many of the mills in this district have fair contracts for rolled copper, but the requisitions against these for delivery are disappointingly small. Copper is recovering in price after a serious fall at the end of March. The non-ferrous tube mills are doing only a moderate business although there is a fair demand for the smaller sizes.

There are signs of improvement in the metal using industries, which is consistent with the increase in building activity with the advent of the outdoor season. There is less unemployment in the Birmingham district and the absorption of labor is spread over a number of industries and this gives rise to the hope that the long-expected revival has at last arrived. The motor and motorcycle trades, which are large users of non-ferrous metals in rolled form and castings, are sending in increased inquiries, and prior to the Easter holidays the automobile factories were busily engaged. This is particularly the case at the light car works in the Coventry district.

The electroplate trade continues dull and there is no sign of any increase of export account. The use of non-ferrous metals for store fixtures is well maintained, and chromium plating continues to find an ever-widening field in British industry.

Brassfounders are poorly employed, and most of the works in this district are unable to keep going for the whole week. There is a definite increase in demand from builders, which is likely to develop further in the coming months. J. A. H.

Business Items—Verified

Lockport Lead Company, Lockport, N. Y., has moved its smelting and refining plants to Cleveland, Ohio. The plants are located at 7610 Bessemer Avenue.

At annual meeting of stockholders of the Scovill Manufacturing Company, Waterbury, Conn., **A. L. Adams** was elected a director. Other directors were re-elected.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Canada, has awarded a contract for a new copper rod rolling mill to the Dominion Engineering Works. The total cost of the mill and equipment will be approximately $225,000.

Charles Hardy, Inc., dealers in ores and metals, announce the removal of their offices from 122 East 42nd Street, New York City, to Central Terminal Building, 415 Lexington Avenue, effective April 20. New telephone numbers: MUrray Hill 2—5930-1-2.

On May 1st, the home office of the **General Ceramics Company** moved to 71 West 35th Street, New York. In these more spacious quarters they should be able to give even better service than in the past to customers who require acid-proof chemical stoneware.

Mentz Collins Brass Works, recently organized at 260 North Front Street, Memphis, Tenn., by **C. A. Mentz** and **O. Collins,** is now the **Chickasaw Brass Works,** owned and operated by Mr. Mentz. Company operates brass, bronze and aluminum foundry and machine shop.

Lewis Roe Manufacturing Company, 1050 DeKalb Avenue, Brooklyn, N. Y., are issuing graphs made by Pratt Institute of Brooklyn, N. Y., showing the saving in horse power by using the Roe roller bearing polishing lathe as compared with the old type of babbitted lathes.

Betsy Ross Electrical Products Corporation, Johnson City, N. Y., have opened up their new office in Room 813, Fifth Avenue Building, 200 Fifth Avenue, New York City, N. Y., in charge of **Kirk S. Heckmann,** assisted by **B. L. Van Gelder.** A full line of samples will be on display at this office.

Plans for a substantial increase in production schedules and employment are in progress at the plant of the **Weber-Knapp Company,** Jamestown, N. Y., manufacturer of brass and bronze hardware for the furniture industry. Return of the wood furniture industry to more normal schedules is expected to reflect favorably on business activities at the Weber-Knapp plant.

Alloy Metal Wire Company, Inc., Moore, Pa., announces the recent appointment of **W. W. Wilson,** 2-219 General Motors Building, Detroit, Mich., and **Metal Parts and Equipment, Inc.,** 4950 Washington Boulevard, Chicago, Ill., as agents to handle its lines of pure nickel and nickel alloys for electrical resistance, stainless steel, cold rolled strip, and cold drawn rod and wire, in their respective territories.

Oakley Valve and Foundry Company, specializing in Monel metal castings and manufacturer of a recently developed automobile valve, has leased for a term of years the building at 17-21 Newark Way, Maplewood, N. J., from Edward McTighe. The space consists of a one-story industrial type building containing over 5,000 square feet and is located on the Rahway branch of the Lehigh Valley Railroad.

Canadian Metal Products Company, Guelph, Ont., Can., subsidiary of **Steel and Tubes, Inc.,** Cleveland, Ohio, has sold to the **Burlington Steel Company, Ltd.,** Hamilton, Ont., its entire equipment, inventory and good will. **H. W. Hinman,** formerly manager of the Guelph plant, has joined the staff of Burlington Steel in charge of the tubing division, and all equipment will be removed to Hamilton immediately.

Electro-Metallurgical Company, 30 East 42nd Street, New York, following completion of new unit at Boncar, W. Va., has awarded contract for another unit to cost over $250,000 with equipment. Contracts have been awarded to **Westinghouse Electric and Manufacturing Company,** East Pittsburgh, Pa., for transformers and accessory apparatus, and awards for other equipment will be made soon. The company is a subsidiary of **Union Carbide and Carbon Corporation.** The latter organization is considering erection of experimental plant for the production of a new plastic product known as "Vinylite."

Union Metal Works, Inc., Chelsea, Mass., has purchased the patterns, stock and general equipment of the **Hamlin-Emery Brass Works,** on Island Street, Boston, Mass., and will remove this material to their Chelsea plant on Carter Street, where they plan a considerable expansion. A liquidation sale of the Hamlin-Emery Brass Works took place recently, after that concern had been successfully manufacturing brass products in Boston for 35 years. They were considered a pioneer in many lines of products. The Union Metal Works, whose general manager is **James Carr,** plans a considerable expansion in production,—probably as much as 25%.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Company of New York, Inc.

MAY 1, 1931.

The seasonal spring advance did not carry on to the extent that it usually does. There was a slight bulge but naturally not nearly to the same extent as usually takes place. Stocks are low and will probably continue that way until real urgent demand for goods in volume makes itself felt. The fluctuations in the price of copper and its products is not conducive to reestablishment of confidence. As soon as buyers see the copper price go to 10c. or higher they begin to think of getting in at the bottom and then it promptly sags off to 9¾c. and 9½c. The result is that by this time everyone feels that the price may slip further and therefore everyone is playing the waiting game.

Looking at the situation in a broad way it appears as if the price of metals has about struck bottom and is scraping along there. Producers of copper are not very anxious to sell much metal at below 10c., and while it is possible that some distress stocks of metal may be offered at a reduction in price, it is believed that the price of copper is so close to the average cost of production that it is virtually on the bottom at between 9 and 10c. The stocks of copper are very slowly falling, and if demand keeps up at even the present rate will begin to fall more rapidly because the amount of metal in process has been reduced almost to the irreducible minimum and production is falling off rather than increasing. The copper situation as a whole is not so bad and could very rapidly change. It is conceivable that quite a scramble for metal might occur; there are, however, so many factors to consider that such a rapid comeback is unlikely and more of a steadying probably will precede normal or increased demand. As stated last month, the copper business is not as badly affected as most other industries. Its rate of operation compares favorably with any other industry.

Nickel and Monel metal prices remain steady and this contributes in no small measure to the degree of confidence with which users of these materials order their requirements. Development of new uses and proper exploitation efforts are helping to maintain the consumption of these materials.

Aluminum demand is holding up and the steady price situation here also is helping.

Taken as a whole, the metals are steadying. The demand for them is holding fairly well and is expected to continue until the business situation picks up. The long term outlook for metals is excellent. They will be used on an ever increasing scale and the markets for them are bound to expand. The recent Architectural Show in New York featured the use of metals for building purposes. An aluminum house was shown; nickel and Monel were featured; nickel silver and other white metal alloys showed the trend in design and taste. Copper, brass and bronze were also on exhibit, and all in all one gained the distinct impression that we are using more and more metal all the time for an ever increasing variety of uses.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

MAY 1, 1931.

The situation in copper is gradually attaining a sounder statistical position as the program of production curtailment begins to tell on accumulated stocks. The decrease in stocks of refined copper during March amounted to 9,424 tons. This was the fourth successive monthly decline. Since December 1, 1930, the reduction in stocks aggregates 15,627 tons. These figures represent the excess tonnage of deliveries over production. It is significant, therefore, that demand has overtaken current output. A further favorable development is evident from the fact that refinery output during the last four months is 56,922 tons less than production during the previous four months.

Market values, however, have not yet begun to rise above the depressing effects of overproduction and underconsumption. Prices during April again touched the low point of 9½ cents. In 1930 there was a quotation made of 9⅜ cents, but with that exception the 9½ cent basis is the lowest in 35 years. For the last four months electrolytic copper has fluctuated between 9½ and 10½ cents a pound. Obviously this level of market values is intensely subnormal and does not afford a sufficient operating income for an industry so essential to the prosperity of the country.

The remedy for eliminating the disturbing factors in the situation is to be found in keeping superabundant supplies from accumulating. This adverse influence is amenable to capable handling. With production brought and kept under control, as a permanent policy, the copper industry would speedily enter a long period of pronounced prosperity. The consumer and the public are also interested in corrective factors that will counteract the adverse conditions in the situation. Export copper sales were in moderate volume throughout the past month. Present price is 10.05 cents c.i.f. European ports.

ZINC

Several adverse influences have operated to depress zinc values. Interests who market the ore were faced with slack current demand thereby forcing prices of both ore and concentrates down to the lowest points in many years. Selling pressure gave impetus to the downward surge for prime western slab zinc thereby sending this grade to 3.50 cents East St. Louis and 3.85 cents New York. Demand was only fair and for much of the time was notably dull. A year ago, slab zinc was 4.75 East St. Louis basis. Smelters stocks showed a decrease in March of 2,896 tons. The surplus tonnage, however, on April 1 amounted to 141,493 tons. This large carryover easily accounts for much of the decline in market prices. The London price of spot zinc dropped to £11 per ton on April 24. This is the lowest price at London of which there is any record.

TIN

A receding market was recorded in tin lately. This commodity fell in line with sagging price schedules of other metals, making it obvious that some potent force is necessary to bring about a vigorous rebound in all the non-ferrous metals. The price situation in tin broke into new low ground for this year touching 24.60 cents for prompt Straits tin on April 21. This represented a loss of fully 2 cents a pound in three weeks. The conspicuous weakness of market movements since last December has created cautious sentiment over the price situation. Despite measures to regulate tin output in the Malaya, Bolivia, Dutch East Indies and Nigeria districts under a quota agreement bearish influences have predominated both here and abroad for some time past. Continued liquidation and lack of support at London have

operated against higher price levels. World's visible supplies decreased 732 tons during March, but free stocks of tin are still 15,635 tons larger than a year ago. However, it begins to look as if producers will manage to put into working effect a restriction agreement which will eventually regulate world supplies to demands.

LEAD

Market conditions in lead have eased off owing to dull demand and uncertainty over the price situation. Weakness in other metals and the sharp recession in security prices held down purchases to restricted quantities. The conservative attitude of buyers had its natural effect on values. Competition for business was keenly developed, but consumers were not inclined to branch out beyond immediate or nearby requirements. Heavy stocks of lead and a large increase to surplus holdings in March have been important factors in depressing prices. The domestic accumulation in producers' hands amounted to 130,426 tons on April 1. These are the largest stocks on record, and are more than three times as large as a year ago.

ANTIMONY

Trading levels for antimony again yielded to factors making for lower prices. Chinese regulars at this writing is available at 6.80c. to 6.85c. in carload deliveries, duty paid. This is the low for this year and 70 points below the high this year. Stocks of antimony in bonded warehouses on April 1 were reported at 1,242 tons, being an increase of 327 tons from December 1. Shipments from China to the United States during the first three months of this year totaled only 725 tons, against 2,146 tons during the first quarter of 1930.

ALUMINUM

The absence of receding tendencies in the market for virgin aluminum stands out boldly in a period of declining values. Apparently there are no developments within or without the industry requiring radical price adjustments. Quotations for virgin aluminum of 98-99% pure have remained unchanged at 22.90c. per pound for the last 10 months. Other metals have been violently deflated during this period. The stabilization of this market is a notable achievement where prices generally have been recording new lows. Production, however, is under masterly control and the industry has been highly profitable. There is more or less elasticity in market movements for remelted aluminum, but even this grade is remarkably steady. Consumption by the automotive industry shows a gradual increase, and demand from other quarters showed some improvement. New uses of aluminum are increasing in various manufacturing fields.

QUICKSILVER

Recent sales of quicksilver were in fair volume. Prices vary according to quantity involved. The European syndicate is credited with carrying large stocks. Current quotations are $102 to $103 per flask.

PLATINUM

Prices have dropped to $23 to $24 per ounce for refined platinum and there was further uncertainty about market trend. This low level contrasts with $66.50 in 1929 and $150 in 1919 and 1920.

SILVER

Selling tactics for Chinese account were a recent feature in silver operations. China operators are widely interested in silver movements. When they become optimistic and aggressive buyers it will probably mean leadership for extensive and steady improvement. Conditions in the silver market are enlisting the attention of prominent interests in Europe, America, the Orient and Mexico. The outlook is for some joint action that will tend to stabilize values throughout the world especially in Oriental countries. Production dropped off somewhat in Mexico and Canada, but increased in the United States. Supplies, however, continue too heavy in the present depression situation.

OLD METALS

Influenced by the downward trend in new metals the selling basis of secondary material showed fractional declines. Demand has been at a fair rate for export. Domestic business is on a restricted scale owing to unsettled conditions prevailing in primary metals. Supplies are ample and at some points show an increase as activity develops in automobile production. Lead and zinc grades reflect the depression felt for the new products. Improvement in the scrap market will be coincident with more satisfactory conditions in the primary metals and the general business outlook.

Daily Metal Prices for Month of April, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3*	6	7	8	9	10	13	14	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	10.125	10.125	....	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125
Electrolytic (f.a.s. N. Y.)	10.00	10.00	....	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Casting (f.o.b. ref.)	9.50	9.50	....	9.50	9.25	9.25	9.50	9.75	9.75	9.75	9.75	9.50	9.25
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.95	3.95	....	3.95	3.925	3.90	3.90	3.85	3.85	3.85	3.75	3.70	3.65
Brass Special	4.05	4.05	....	4.05	4.025	4.00	4.00	3.95	3.95	3.95	3.85	3.80	3.75
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	26.625	26.50	....	26.50	25.85	25.60	25.90	25.80	25.60	25.65	25.25	24.875	25.15
Pig 99%	25.625	25.50	....	25.50	24.875	24.70	25.00	24.875	24.70	24.75	24.35	24.10	24.35
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	4.25	4.25	....	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Aluminum c/lb. Duty 4c/lb	23.30	23.30	....	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	....	35	35	35	35	35	35	35	35	35	35
Shot	36	36	....	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	....	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.00	7.00	....	7.00	7.00	6.95	6.95	6.95	6.90	6.90	6.85	6.85	6.85
Silver c/oz. Troy Duty Free	28.125	27.625	....	27.50	27.25	27.50	28.125	28.125	28.125	28.375	28.375	28.875	28.875
Platinum $/oz. Troy Duty Free	25.00	25.00	....	25.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00

	20	21	22	23	24	27	28	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	9.875	9.875	9.875	9.875	9.875	9.875	9.875	9.625	9.625	10.125	9.625	9.994
Electrolytic (f.a.s. N. Y.)	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.50	9.50	10.00	9.50	9.869
Casting (f.o.b. ref.)	9.25	9.50	9.50	9.50	9.50	9.125	9.125	9.125	9.125	9.75	9.125	9.429
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.625	3.625	3.55	3.50	3.50	3.40	3.40	3.375	3.35	3.95	3.35	3.693
Brass Special	3.725	3.725	3.65	3.60	3.60	3.45	3.45	3.425	3.40	4.05	3.40	3.783
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	24.65	24.625	24.85	24.75	24.625	23.875	23.75	23.75	23.35	26.625	23.35	25.120
Pig 99%	23.85	23.70	24.00	23.875	23.75	23.10	23.00	23.00	22.70	25.625	22.70	24.252
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	4.25	4.25	4.25	4.15	4.05	4.05	3.90	3.80	3.80	4.25	3.80	4.167
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.85	6.85	6.85	6.85	6.85	6.80	6.80	6.75	6.75	7.00	6.75	6.883
Silver c/oz. Troy Duty Free	28.875	28.75	28.375	28.875	28.50	28.75	28.50	28.50	28.00	28.875	27.25	28.286
Platinum $/oz. Troy Duty Free	24.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	25.00	23.00	23.762

*Holiday.

Metal Prices, May 4, 1931

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 9.625. Electrolytic, 9.00. Casting, 9.00.
Zinc: Prime Western, 3.35. Brass Special, 3.40.
Tin: Straits, 22.875. Pig, 99%, 22.125.
Lead: 3.80. **Aluminum,** 23.30. **Antimony,** 6.70.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $104. **Bismuth,** $1.50.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price May 4) 28.375.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $23.00.

INGOT METALS AND ALLOYS

		Duty
Brass Ingots, Yellow	7⅜to 8	45%
Brass Ingots, Red	9¼to11	45%
Bronze Ingots	10½to14	45%
Casting Aluminum Alloys	19 to22	4c lb.
Manganese Bronze Castings	22 to37	45%
Manganese Bronze Ingots	9 to11	45%
Manganese Bronze Forgings	32 to40	45%
Manganese Copper, 30%	23 to30	25%
Monel Metal Shot	28	25%
Monel Metal Blocks	28	25%
Phosphor Bronze Ingots	10½to13	45%
Phosphor Copper, guaranteed 15%	14½to16	3c lb.
Phosphor Copper, guaranteed 10%	14 to15½	3c lb.
Phosphor Tin, no guarantee	33 to40	Free
Silicon Copper, 10%	25 to35	45%

OLD METALS

	Buying Prices	Duty
Crucible Copper	7⅜to 7⅝	Free
Heavy Copper and Wire, mixed	6⅞to 7⅛	Free
Light Copper	6 to 6⅜	Free
Heavy Brass	4 to 4¼	Free
Light Brass	3¼to 3¾	Free
No. 1 Composition	5¾to 6¼	Free
Composition Turnings	5½to 5¾	Free
Heavy Lead	2¾to 3	2⅛c. lb.
Old Zinc	1⅛to 1⅜	1½c. lb.
New Zinc Clips	2 to 2¼	1½c. lb.
Aluminum Clips (new, soft)	13 to14	4c. lb.
Scrap Aluminum, cast, mixed	4½to 4¾	4c. lb.
Scrap Aluminum sheet (old)	9½to10½	4c. lb.
No. 1 Pewter	14 to15	Free
Nickel Anodes	22 to23	10%
Nickel scrap (new)	24 to25	10%

Wrought Metals and Alloys

Effective April 28, 1931

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled		2½c. lb.
Mill shipment	19⅜c.to20⅜c.	.....
From stock	20⅜c.to21⅜c.	.....
Bare wire	11¼c.to11½c.	25%
Seamless tubing	21⅞c.to22⅞c.	7c. lb.
Soldering coppers:		45%
Lots of 300 lb. or more	17⅞c.	
100 to 300 lb.	18⅜c.	

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound on lots of 5,000 lbs. or more.

	High Brass	Low Brass	Bronze	Duty
Sheet	16¾c.	18⅛c.	18¾c.	4c. lb.
Wire	17¼c.	18⅝c.	19¼c.	25%
Rod	15c.	18⅝c.	19¼c.	4c. lb.
Brazed tubing	24⅝c.	.....	28⅝c.	12c. lb.
Open seam tubing	24¾c.	.....	26¾c.	25%
Angles, channels	24¾c.	.....	26¾c.	12c. lb.
Seamless tubing	21⅝c.	22½c.	23⅜c.	8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	24½c.	10% Quality	27⅝c.
15% Quality	26¾c.	15% Quality	31⅝c.
18% Quality	28c.	18% Quality	35⅛c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices on lots of 100 lbs. or more. (Duty 4c. lb.)

Tobin Bronze Rod	18⅝c.
Muntz or Yellow Metal Sheathing (14"x48")	18¾c.
Muntz or Yellow Rectangular sheet other sheathing	18¾c.
Muntz or Yellow Metal Rod	15⅞c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.30
Aluminum coils, 24 ga., base price 30.00
(Duty 7c. per lb.)

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

(Duty 25% ad valorem, plus 10% if cold worked.)

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

(Duty 25% ad valorem, plus 10% if cold worked.)

SILVER SHEET

Rolled sterling silver (May 4) 31.50c., Troy oz. upward, according to quantity. (Duty free.)

ZINC SHEET

(Duty 2c. per lb.)

	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	Net Base 9.50
Casks, jobbers' price	9.75
Open casks, jobbers' price	10.50 to 10.75

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.
(Duty free.)

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c over; less than 25 lbs., 25c. over. Prices F. O. B. mill. (Duty free.)

Supply Prices, May 4, 1931

ANODES

Copper: Cast	21⅛c. per lb.	**Nickel:** 90-92%	44c. to 45c. per lb.
Rolled, sheets, trimmed	18½c. per lb.	95-97%	44c. to 47c. per lb.
Rolled, oval	17⅜c. per lb.	99%	46½c. to 49c. per lb.
Brass: Cast	19⅞c. per lb.		
Zinc: Cast	10¾c. per lb.		

Silver: Rolled silver anodes .999 fine were quoted May 4 from 31.50c. per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1″ to 2″	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3¼	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

11″ 20 ply 64/68 Unbleached	$16.38 to 20.28
14″ 20 ply 64/68 Unbleached	24.32 to 30.12
11″ 20 ply 80/92 Unbleached	20.48 to 25.36
14″ 20 ply 80/92 Unbleached	30,17 to 37.37
11″ 20 ply 84/92 Unbleached	24.60 to 35.59
14″ 20 ply 84/92 Unbleached	36.53 to 52.80
11″ 20 ply 80/84 Unbleached	26.35 to 32.63
14″ 20 ply 80/84 Unbleached	39.06 to 48.38
Sewed Pieced Buffs, per lb., bleached	30c. to 79c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Crystals	lb.	.07¾
Chromic, 75 to 400 lb. drums	lb.	.16½-.20
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.15¾-.21¼
Denatured, drums	gal.	.30-.50
Alum—Lump, barrels	lb.	.03¾-.04
Powdered, barrels	lb.	.03½-.04
Ammonium sulphate, tech., bbls.	lb.	.03½
Sulphocyanide	lb.	.36
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.24
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½
Cyanide (100 lb. kgs.)	lb.	.41
Sulphate, bbls.	lb.	.0495
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.08
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.25¾-.26½
Cyanide (fluctuating)	oz.	.33-.40
Nitrate, 100 ounce lots	oz.	.22½-.23¼
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Hyposulphite, kegs	lb.	.03½-.04
Nitrate, tech., bbls.	lb.	.03½
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulphocyanide	lb.	.32½-.42½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.28
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¼
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½